THE BRICKBUILDER.

VOL. 13 FEBRUARY 1904 NO. 2

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FROM WORK OF ANDREWS, JAQUES & RANTOUL, DAVIS & BROOKS, McKIM, MEAD & WHITE, YORK & SAWYER.

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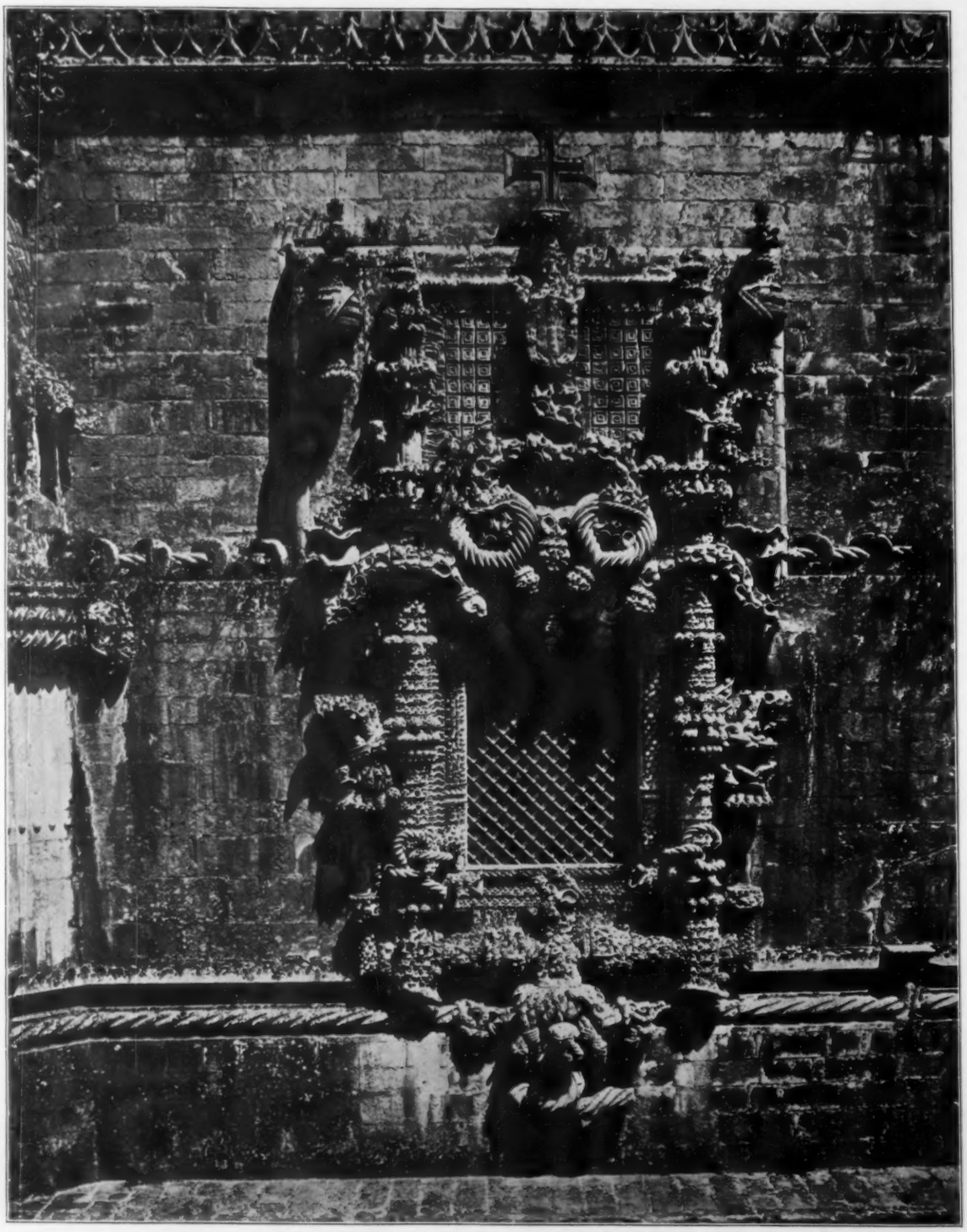

WINDOW IN THE CONVENT OF CHRIST, THOMAR, PORTUGAL.

THE BRICKBVILDER

VOL. 13 No. 2 — DEVOTED · TO · THE · INTERESTS · OF ARCHITECTVRE · IN · MATERIALS · OF · CLAY — FEBRUARY 1904

THE BRICKBUILDER.

PUBLISHED MONTHLY BY

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	PAGE		PAGE
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Architectural Faience	II	Clay Chemicals	IV
" Terra-Cotta	II and III	Fire-proofing	IV
Brick	III	Machinery	IV
" Enameled	III and IV	Roofing Tile	IV

Advertisements will be printed on cover pages only.

THE BALTIMORE FIRE.

THE terrible fire which has wiped out the heart of the business center of Baltimore offers the first opportunity which the country has had for observing the action of a thoroughly modern steel frame structure when exposed to the terrific heat of a general conflagration. The most valuable lessons, however, of this fire are not to be gleaned by a casual visit or inspection of the smoking ruin. The reports of the fire which have appeared in the daily press have been entirely from a popular standpoint and have presented the impressionistic aspect of a great calamity, but almost without exception have been very misleading in specific details. Particularly as regards the action of burnt clay, the daily press has in most instances been either silent or sweepingly incorrect. The fire has beyond a question demonstrated the fact that burnt clay will amply protect the structure of a steel frame building, and is the only fire resisting material available for external use. The exact action of burnt clay in this fire has already been carefully studied on the spot by members of THE BRICKBUILDER'S staff, but in order to more thoroughly cover the ground and to be able to present a comprehensive study to our readers, more time is needed to prepare in a complete form all that can be gleaned from the lessons of this fire.

It is of interest to note that the authorities at Baltimore appear to be keenly alive to the possibilities within their reach. All building permits have been revoked, and the authorities are deliberately and intelligently considering what changes, if any, should be made in the street lines or in the arrangements of the principal avenues, and a commission, including many of the best architects in the city, is carefully studying the building laws with a view to their revision. All of this will be considered in detail in future issues of THE BRICKBUILDER.

IT is reported that the authorities having charge of the new building for the Department of Agriculture in Washington have insisted upon locating the building in such manner as to result in reducing the width of the Mall by two hundred feet. This is a move which ought to receive the prompt and emphatic condemnation of every one interested in the artistic welfare of our capital. It is directly contrary to the suggestions of the commission, which recently made such an admirable report upon the improvement of Washington, and seems such a needless piece of intrusion that it is hard to have any patience with such shortsighted action. Washington has been named the City of Magnificent Distances, and all its parks and avenues were originally laid out on a scale of lavish magnificence which, while totally out of place for the small village which in the early part of the last century formed itself between the White House and the Capitol, is by no means out of scale with the city which is now rapidly rising to completion and which in a few years ought to be the most magnificent city in the country. The Improvement Commission recognized all the possibilities of Major L'Enfant's original plan, and the splendid proportions of the Mall were preserved and amplified rather than restricted. It seems to be a government propensity to tinker with well-constructed plans, and if we had in the presidential chair a man with less force of character and one less alive to æsthetic possibilities it would be idle to expect any continued carrying out of the commission's report; but it is to be hoped that President Roosevelt will promptly veto any encroachment on the Mall. There is plenty of room for the Agricultural Building, and we understand that the architects of the edifice are themselves strongly opposed to the new location. The American Institute of Architects, which has done so much to bring about the formation of the Improvement Commission, would be perfectly justified in protesting against this impending disregard of the commission's wise recommendations.

Hospital Planning. II.

SUBURBAN HOSPITALS.

(Continued.)

BY BERTRAND E. TAYLOR.

THAT the suburban hospital, properly planned, located amid ideal surroundings, possesses essential advantages over city hospitals, large or small, must be evident to all. However perfect the scheme of ventilation, it is absolutely impossible to rival or approximate to the vitalizing, bracing and life-giving purity of the air of an elevated country hospital site. Considering the vile combination of deadly gases, the myriad of germs and micro-organisms and the great amount of filthy dust that compose so large a per cent of the air in our large cities, — elements, to be sure, that can be partially negatived by straining and washing, by elaborate and expensive devices, — we can but feel, then, that there are vastly more reasons, and these of more vital importance, for patronizing a small country hospital, especially for surgical work or any disease having the possibility of a long convalescence, than there are for going to the country for the usual recuperative purposes of a holiday vacation.

During the Civil War the army hospital statistics showed startling contrasts in favor of the hospitals located back in the country, at an elevation, among the hills.

It may possibly be worth while to consider a few of the early American suburban hospitals.

The only one in a specially designed plant built previous to 1880, viz., the one at Pittsfield, Mass., was very crude and incomplete, although it had the inestimable advantages of the isolation of patients in individual rooms.

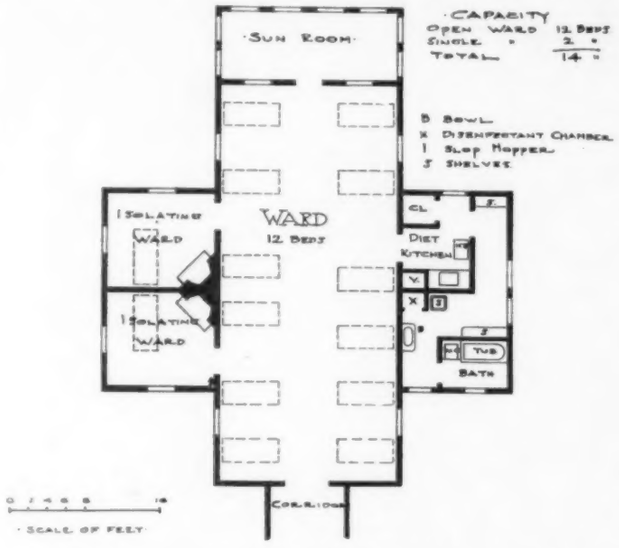


FIG. 9. THAYER WARD, HOSPITAL, NEWTON, MASS. (1884.)

Most of the American suburban hospitals of the period 1880–1890 are of comparatively little interest to us to-day, except as types showing the tentative struggles after the ideal and generally studied, with little or no improvement on the English models of the previous decade.

There are, however, a few that are of some interest and that are accessible, and a short description of these, with plans, is presented.

One of the pioneer suburban hospitals in America is the Newton Hospital. It was organized in 1880 and incorporated in 1881 as a

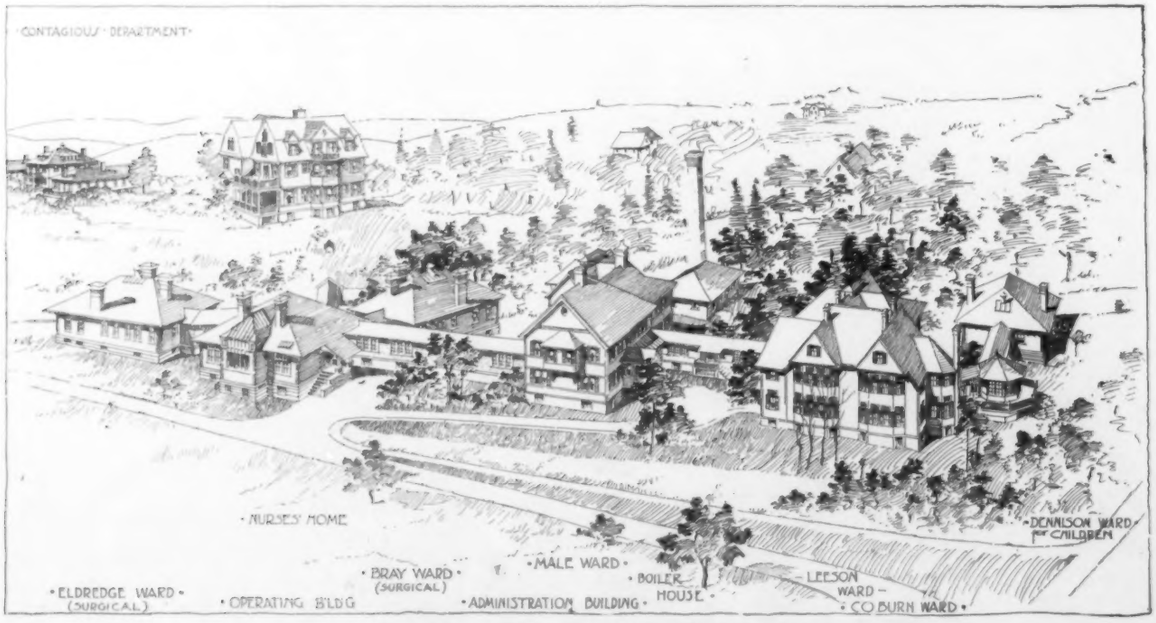


FIG. 10. NEWTON HOSPITAL, NEWTON, MASS.
Kendall, Taylor & Stevens and W. P. Wentworth, Associate Architects.

"cottage hospital." Nine acres of land were purchased and two small buildings, very cheaply constructed of wood, were built and opened to the public in 1886. The pavilion, known as the Thayer ward (Fig. 9), was very

can village hospitals built about 1890, having a good general scheme, but showing the little advance in operating facilities in the ten years or so after Mr. Burdett's plan was published. (Figs. 12 and 13.)

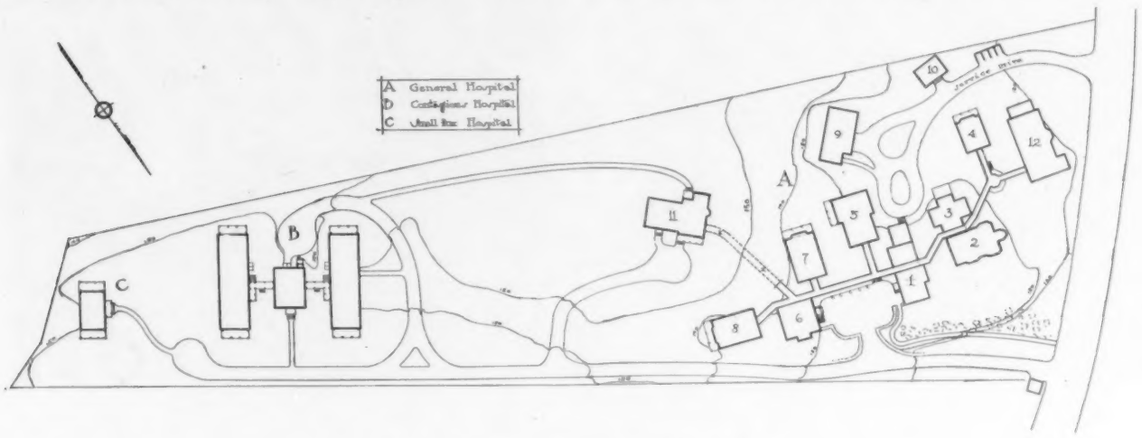


FIG. 11. NEWTON HOSPITAL, GROUND PLAN.

Key.—1. Administration and Service. 2. Private Pavilion. 3. Female Medical Pavilion. 4. Children's Pavilion. 5. Male Medical Pavilion. 6 Operating Building. 7. Male Surgical Pavilion. 8. Female Surgical Pavilion. 9. Boiler House and Laundry. 10. Morgue. 11. Nurses' Home. 12. Maternity Pavilion. XX. Subway.

badly arranged as will be seen by reference to the plan, but the open ward was in itself quite an impressive little ward, with gable ends and an elliptical vault carried into the roof, and was quite well lighted in spite of the fact that the private or isolating rooms and the diet kitchen, toilet and bath seem to have been placed so as to cut off as much light as possible. The use of the diet kitchen as a passage to the toilet, bath and service room is about as bad as it could be, also the serving of the isolating rooms across the ward.

FIG. 12. CITY HOSPITAL, QUINCY, MASS.

The operating room was located in the Administration Building, and was small and poorly lighted. It was beside the front and main entrance and had few conveniences, yet in spite of all the deficiencies good work was done in this room for twelve years until the new surgical department of three buildings was dedicated in 1898.

The hospital has continually grown from that day to this until now there is a capacity of one hundred and twenty-five beds in the general hospital and sixty beds in the isolating department for scarlet fever, diphtheria and smallpox; and a well-equipped school for training forty nurses per year. The appreciation of the service is so great that many other additions and improvements are designed and will soon be executed. (Figs. 10 and 11.)

The plan of the Quincy (Mass.) Hospital is interesting as showing one of the comparatively early types of Ameri-

The Cambridge (Mass.) Hospital is undoubtedly the very best of the early suburban hospitals. (Fig. 14 and 15.) It was opened in 1886, and comprised three buildings. It had the advantage of expert medical advice and careful planning on the part of its architect, Mr. William L. Chamberlain; and the result was naturally a great success, both as to general convenience for its special work and its dignified and artistic exterior.

The greatest deficiency, as compared with the requirements of the present day, is, in common with all hospi-

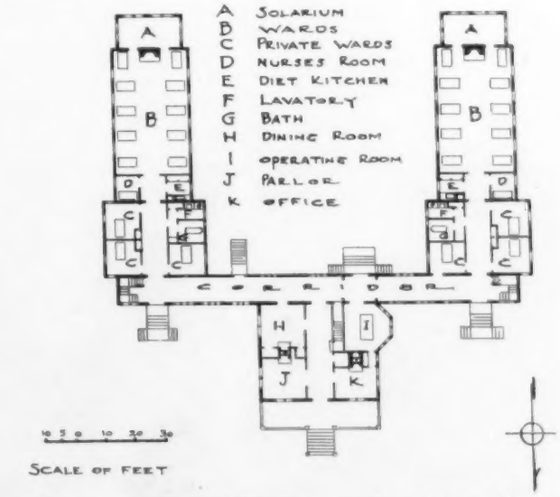


FIG. 13. PLAN, CITY HOSPITAL, QUINCY, MASS. (1890.)

tals designed previous to 1890, the almost total lack of any adequate provision for operations. This may be accounted for, to a degree, by its contiguity to the large Boston hospitals; but that this fact did not preclude the possibility of a more perfect and complete operating

department is shown by the fact that such a department was added in a separate special pavilion in 1898, at a cost of twenty thousand dollars.

A fairly complete isolating department of sixteen beds was built on the rear of the lot in 1891, and this was one of the earliest and best contagious departments of any small hospital in America.

A large and very imposing nurses' home was built in 1896, and the institution still maintains a leading position among hospitals of its class.

The Hitchcock Memorial Hospital at Hanover, New Hampshire, was designed in 1890 by Rand & Taylor, architects (see Figs. 16, 17 and 18), and was undoubtedly the first small hospital in America built of absolutely fireproof materials. The Guastavino laminated tile construction was used throughout, with practically no steel except the roof. The plan is of the usual four pavilion type, administration and service, male pavilion, female pavilion and operating building, this latter unusually pretentious for a hospital of but thirty beds, as it contains a large clinical amphitheater for the use of the medical students of Dartmouth College.

A novelty in the way of a conservatory was introduced, a feature that must be a source of great interest and pleasure.

The sun rooms, instead of being at the south end of the open wards, are simply the expanded, thoroughly lighted connecting corridors. (Fig. 19.) They serve this purpose admirably, are more convenient for both open ward and private ward patients, and are much more pleasant to walk through than the partly lighted tunnels one sometimes sees. (Fig. 20.)

FIG. 14. CAMBRIDGE HOSPITAL, CAMBRIDGE, MASS. William L. Chamberlain, Architect.

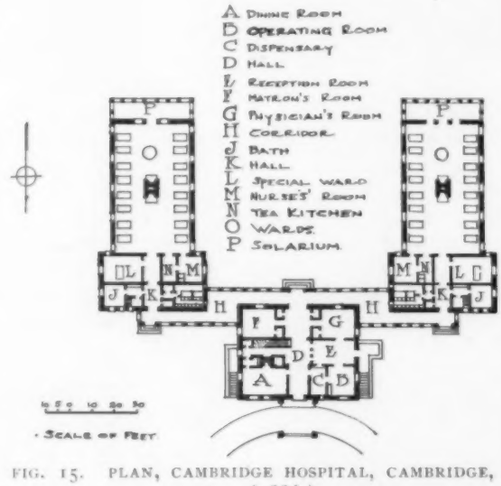


FIG. 15. PLAN, CAMBRIDGE HOSPITAL, CAMBRIDGE, MASS. (1886.)

FIG. 16. HITCHCOCK MEMORIAL HOSPITAL, HANOVER, N. H. Rand & Taylor, Architects.

This hospital shares with all three or four pavilion hospitals the inevitable defect of crowding, as the administration, the best private patients' rooms and the nurses each have their respective floor in the Administration Building, while the matron, head nurse and servants all have to be housed in the service extension at the rear over the dining room and service portion. These various uses, especially the introduction of patients' rooms, are to a degree incongruous and it is impossible to properly provide for them all in one building.

The Waltham (Mass.) Hospital was built in 1892, and is quite unique in being built of the so-called slow burn-

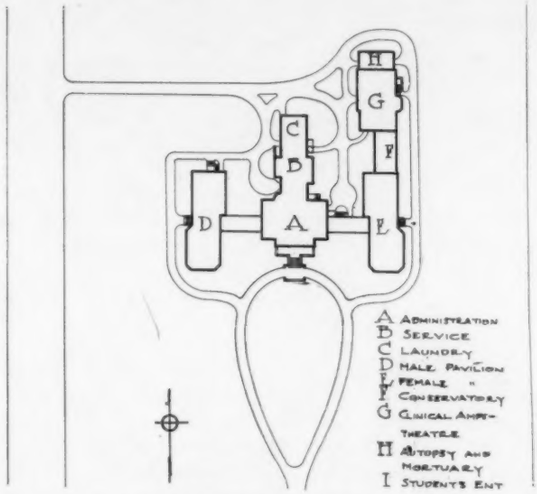


FIG. 17. HITCHCOCK MEMORIAL HOSPITAL, HANOVER, N. H.

ing or mill construction. It was designed by Mr. William Atkinson, architect, and although the mill idea is carried even to the flat roof with no attempt at ornamentation, the scheme is very interesting and practical. (Figs. 21, 22 and 23.)

A very unusual feature is the little brick operating room, entirely isolated by a brick enclosed cut-off, and the

FIG. 20. HITCHCOCK MEMORIAL HOSPITAL.

FIG. 19. HITCHCOCK MEMORIAL HOSPITAL.

lavatory tower, also absolutely isolated, a very common and in fact the almost invariable custom in Great Britain, but seldom seen here. The conveniences almost invariably found in the pavilion — viz., the diet kitchen, linen room, clothing room, medicine closet, etc. — are not provided for here, possibly because the connecting corridor between pavilion and Administration Building is so short. One feature of this plan, quite unique, is the janitor's office by the main

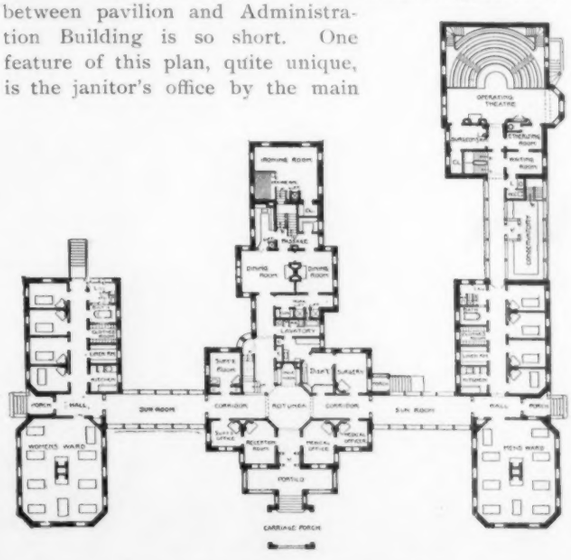


FIG. 18. PLAN, HITCHCOCK MEMORIAL HOSPITAL, HANOVER, N. H.

entrance, like that for the Parisian *concierge*. It will be observed that the kitchen, laundry and servants' rooms are on the third floor, certainly a very unusual scheme for any country building; but there are many reasons why this disposition of these very necessary accessories is a good one, especially on a lot of restricted area.

The Watts Hospital, built by Rand & Taylor, architects, in Durham, North Carolina, in 1893, was an attempt to build an ideal small hospital for about $20,000. (Figs. 24 and 25.)

It will be seen that the classification was carried as far in this little hospital as it had at that time been carried in any suburban hospital, with the exception

that, as the colored servants of the South sleep at home, there was no necessity of providing special servants' quarters. The land sloping away to the rear (north), the basement of Administration Building and corridor was utilized for kitchen and laundry. The little isolated operating building was modeled on the McLean operating building of the Roosevelt Hospital, New York, at that time considered the most perfect of its class in the country. The connecting corridors were provided with removable glazed sash to provide sun rooms in winter and open air in summer.

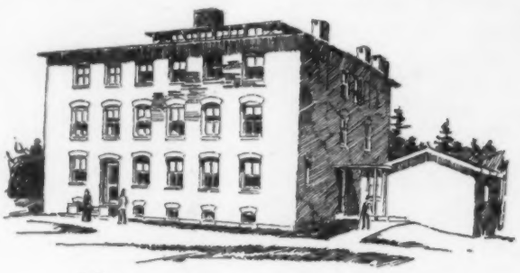


FIG. 21. HOSPITAL, WALTHAM, MASS.
William Atkinson, Architect.

The Heaton Hospital, Montpelier, Vermont (Figs. 26 and 27), was built by Rand & Taylor, architects, in 1894, and is of essentially the same general type as the Watts Hospital, and, like the Hitchcock and Watts hospitals, fronting south. The site is ideal on a hill overlooking the city.

This and the Watts Hospital were, of necessity, built of wood.

The Malden Hospital, designed by S. Edwin Tobey, architect, in 1894, is quite similar in general plan to the Cambridge Hospital. It is of a very substantial brick type. (Figs. 28, 29 and 30.) The original hospital was of the usual three pavilion groups with the obvious limitations before noted. The site was most happily chosen on a high wooded elevation, isolated from the thickly settled portions of the city, with ample grounds. The hospital has been added to at various times and now has an isolated boiler plant, laundry, nurses' home and a just completed private patients' building. The most interesting and unique feature of this hospital is the convalescent patients' cabin (Figs. 31 and 32), a most valuable addition to the accessories of a suburban hospital in a direction that should be emulated.

FIG. 22. PLAN, FIRST FLOOR, MAIN AND WARD BUILDINGS, HOSPITAL, WALTHAM.

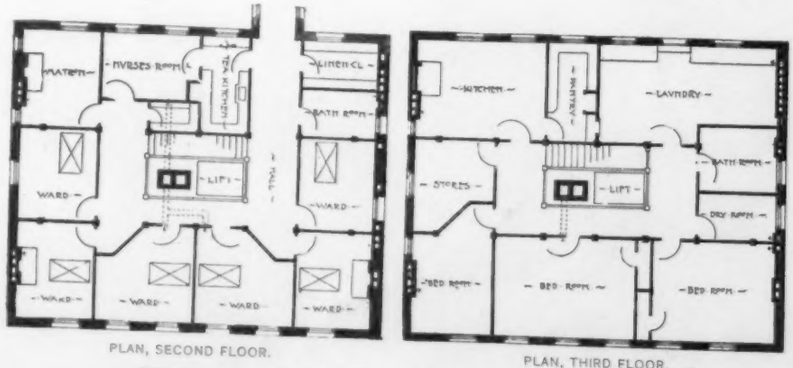
The Portsmouth (N. H.) Hospital is simple and dignified in exterior effect and is of the general three pavilion type. A plan is not available, but the illustration (Fig. 33) gives a good idea of the general scheme. The pavilions are quite small, giving room for comparatively few open ward beds, but the purpose of the structures is evident, although there seems to be no airing balconies or solaria.

The Allentown (Pa.) Hospital (Fig. 34) is an interesting example of a larger hospital of the same three pavilion type, the pavilions connected by short corridors back of airing balconies. The general scheme is clearly expressed by the illustration, and it certainly looks like a hospital.

The Ogden Arnot Hospital, Elmira, New York (Figs. 35 and 36), is evidently beautifully situated amid broad lawns with proper isolation from incongruous surroundings, and looks a hospital, but the plan could scarcely be worse in several respects. The operating room is in the corner of the public hall, with no adequate accessories and an almost impossible connection with the east surgical pavilion. The medical pavilions are inadequately isolated from the administration portion and are too intimately connected with the toilet rooms.

The Margaret Pillsbury Hospital, Concord, New Hampshire (Fig. 37), would make an admirable school building possibly, but it can scarcely fulfill the demands of a general hospital, for in a block plan of this type there can be no proper isolation or classification of sex and disease. This is an extreme type, and fortunately there are few like it that are so intentionally.

The old Anna Jaques Hospital (Fig. 38) at Newburyport, Massachusetts, represents one of a large class of hospitals that make use of an old dwelling house as an expedient, and, in my judgment, a most justifiable one. Here, as in all such hospitals, the male and female wards and single rooms, the surgical and



PLAN, SECOND FLOOR. PLAN, THIRD FLOOR.

FIG. 23. MAIN BUILDING, HOSPITAL, WALTHAM, MASS.

medical cases, the maternity and the children's departments, the typhoid and the D. T.'s, if they have them, are more or less mixed up and all somewhat interfered

FIG. 24. WATTS HOSPITAL, DURHAM, N. C.
Rand & Taylor, Architects.

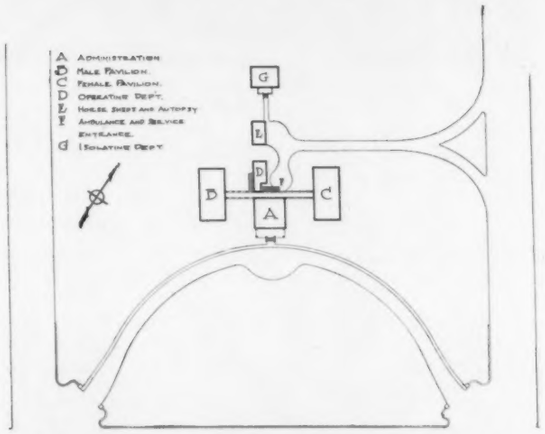


FIG. 25. PLAN, WATTS HOSPITAL, DURHAM, N. C.

with by the necessary movements of the management, the visitors and the contiguity of the operating department, which is generally limited to a moderate sized room.

All these limitations are very evident and very annoying and difficult to harmonize, but the temporary character of the occupation justifies the use.

The other extreme, possibly, is shown in the interesting plan of the Backus Hospital, Norwich, Connecti-

FIG. 28. FRONT VIEW.

FIG. 29. REAR VIEW.

HOSPITAL, MALDEN, MASS. S. Edwin Tobey, Architect.

cut (Figs. 39 and 40), built by Gardner, Pyne & Gardner, architects, where, instead of the one building of the "block" type or the prevailing three building type of most hospitals previous to 1900, we have seven distinct buildings separated by unusually long corridors. This represents a long look ahead, and although this is scarcely a strictly "village" hospital, yet its units are small and the total number of beds is not large.

The Springfield (Mass.) Hospital (Figs. 41 and 42), by

FIG. 26. HEATON HOSPITAL, MONTPELIER, VT.
Rand & Taylor, Architects.

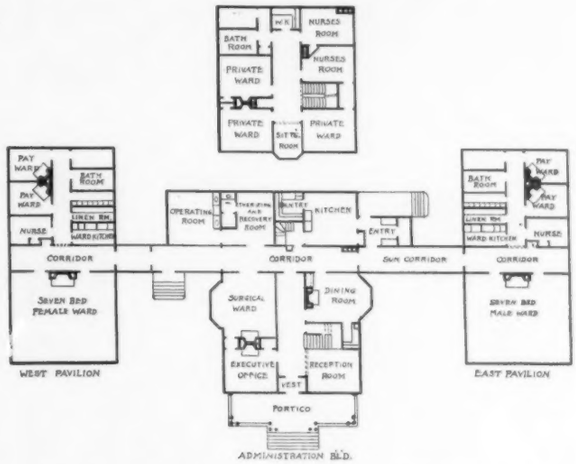


FIG. 27. PLANS, HEATON HOSPITAL, MONTPELIER, VT.

the same architects, is a very unique plan with a picturesque exterior.

The Burbank Hospital, Fitchburg, Massachusetts (Figs. 43 and 44), was built in 1899 by Kendall, Taylor & Stevens, architects. The site was an irregular elevated plateau facing south, backed by a wooded hill.

The conditions thus are unusually ideal, especially as the grounds are of many acres.

The materials of the buildings are brick with granite trimmings, slate roofs, etc. On account of the great area of the grounds and the open character of the surroundings, a formal garden enclosure was suggested with

inclined planes leading down from each sun room. This garden with the nurses' home, the private pavilion, are yet to be built.

The foregoing examples represent fairly the general condition of suburban hospital architecture in America up to the year 1900.

COMPARISON OF ENGLISH AND AMERICAN BUILDING METHODS.

A VERY interesting lecture was recently given to the members of the Institute of Builders at the Society of Architects, London, by Mr. Charles Heathcote, F. R. I. B. A. We are inclined to assume a certain infe-

FIG. 30.

riority on the part of the average British workman, and just at present seem inclined to overestimate the ability of the average American contractor. While we do many things excellently here, and while, when it comes to a case of hustle, we can give points to the world, it by no means follows that our methods and manners are perfected. Mr. Heathcote, while praising very highly Ameri-

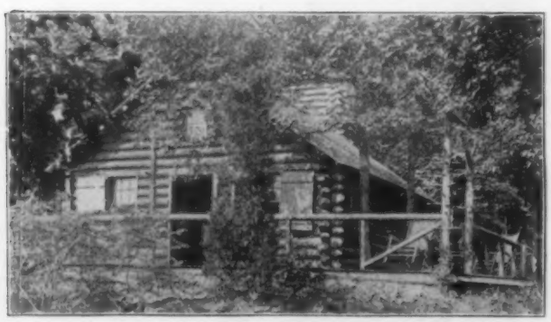


FIG. 31. CONVALESCENT BUILDING, HOSPITAL, MALDEN, MASS.

FIG. 32. INTERIOR CONVALESCENT BUILDING, HOSPITAL, MALDEN, MASS.

can methods and holding them up as examples for his English brethren, shows by citations from his own work that English methods are far from being behind the times. The oft-cited case of the speed with which bricks were laid in the Westinghouse plant near Manchester is not altogether an illustration of American hustle.

FIG. 33. COTTAGE HOSPITAL, PORTSMOUTH, N. H.

The material was all on the ground before the American contractors took hold of it, there was no lack of money or men, and all conditions were favorable for the most rapid progress. Mr. Heathcote cites several purely British instances which show just as great rapidity in execution and with possibly even better quality of work. Speak-

FIG. 34. HOSPITAL, ALLENTOWN, PA.

ing of methods to facilitate speed, he states it as a practice that in his own buildings he prepares what he terms progress plans giving the dates at which certain parts of the work are expected to be completed, and he makes it the duty of the superintendent of any one part to see that such time instructions are carried out. This is organization. It saves confusion, enables the architect and the builder to check the progress of the work, and intelli-

FIG. 35. ARNOT OGDEN MEMORIAL HOSPITAL, ELMIRA, N. Y.

gently plans for continued speed rather than irregular spurts. And while possibly some of our more highly organized building companies may have a similar plan of operation, it is very seldom that our architects do

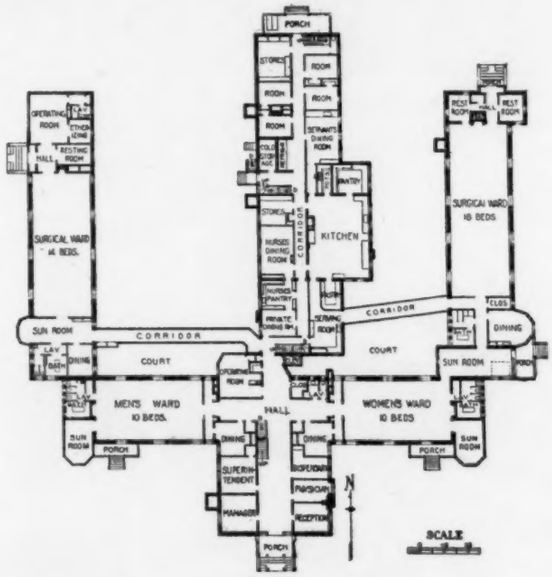


FIG. 36. PLAN, ARNOT OGDEN MEMORIAL HOSPITAL, ELMIRA, N. Y.

such things, though it is clearly a part of their work to plan both the building itself and its execution.

The picture he draws of the freedom of the American workman unfortunately does not altogether apply to our large cities. It is a fact that our workmen are better paid, and generally speaking they give more for their money

FIG. 37. MARGARET PILLSBURY GENERAL HOSPITAL, CONCORD, N. H.

than can be had abroad, but if the building trades continue to be burdened with walking delegates in the manner in which they have suffered during the past year, our superiority in building methods will speedily dwindle to the vanishing point.

FIG. 38. ANNA JAQUES HOSPITAL, NEWBURYPORT, MASS. ESTABLISHED 1884.

OBJECTIONS TO CONCRETE.

WE have been asked to state succinctly our objections to the use of concrete for floor construction and our attention has been called to the successful use which was made of this material by the Romans. Our preference for terra-cotta is a perfectly logical one. However excellent concrete may prove in some cases, terra-cotta is more so. If there were no other reason we would prefer a terra-cotta block flooring for the reason that the ever present danger from non-skilled labor which has to be employed in connection with setting such work is far less with terra-cotta blocks which are made and thoroughly finished before being brought to the building than with a construction such as concrete in which the carelessness of a single workman may result in weaknesses which would

FIG. 39. BACKUS HOSPITAL, NORWICH, CONN. Gardner, Pyne & Gardner, Architects.

not be reasonably expected until after a time when the building should properly be completed. There is the further pecuniary objection that concrete sets up slowly and does not attain its maximum strength for a number of months after it is put in position, thereby delaying the building, whereas a few days will suffice to thoroughly set the relatively slight amount of mortar which is used in setting terra-cotta blocks. As regards the success which attended the use of concrete in Roman construction it must be remembered that in the Roman systems concrete was a mere filling, that its surface was invariably protected by a soffit of brick or terra-cotta, that in Roman

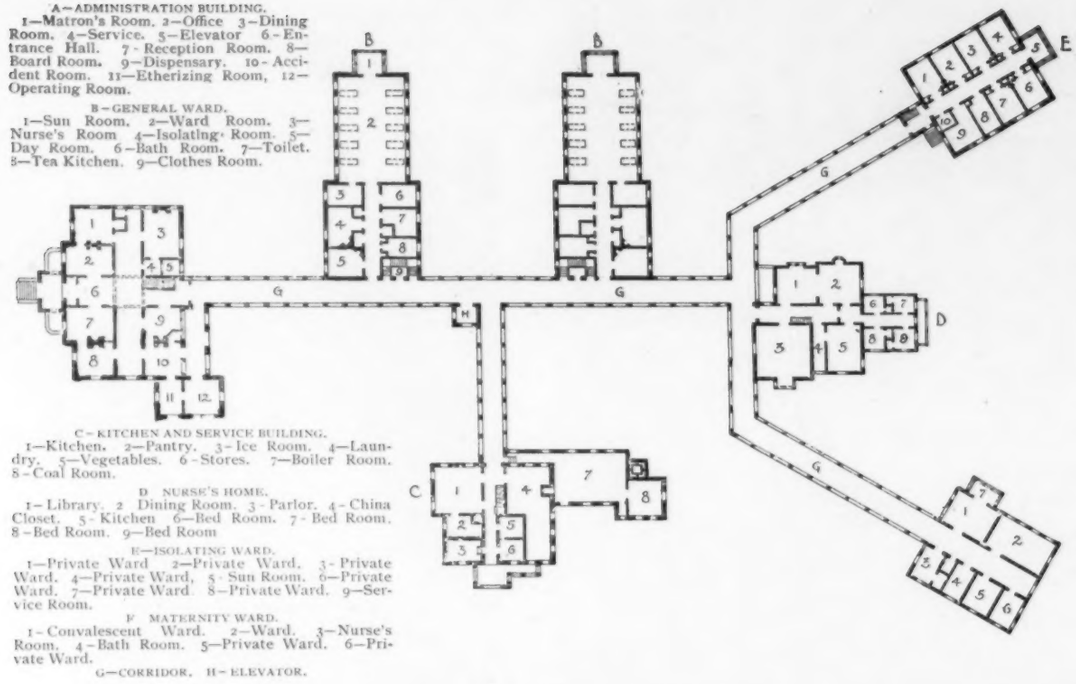

A—ADMINISTRATION BUILDING.
1—Matron's Room. 2—Office 3—Dining Room. 4—Service. 5—Elevator 6—Entrance Hall. 7—Reception Room. 8—Board Room. 9—Dispensary. 10—Accident Room. 11—Etherizing Room, 12—Operating Room.
B—GENERAL WARD.
1—Sun Room. 2—Ward Room. 3—Nurse's Room 4—Isolating Room. 5—Day Room. 6—Bath Room. 7—Toilet. 8—Tea Kitchen. 9—Clothes Room.
C—KITCHEN AND SERVICE BUILDING.
1—Kitchen. 2—Pantry. 3—Ice Room. 4—Laundry. 5—Vegetables. 6—Stores. 7—Boiler Room. 8—Coal Room.
D NURSE'S HOME.
1—Library. 2 Dining Room. 3—Parlor. 4—China Closet. 5—Kitchen 6—Bed Room. 7—Bed Room. 8—Bed Room. 9—Bed Room
E—ISOLATING WARD.
1—Private Ward 2—Private Ward. 3—Private Ward. 4—Private Ward. 5—Sun Room. 6—Private Ward. 7—Private Ward 8—Private Ward. 9—Service Room.
F MATERNITY WARD.
1—Convalescent Ward. 2—Ward. 3—Nurse's Room. 4—Bath Room. 5—Private Ward. 6—Private Ward.
G—CORRIDOR. H—ELEVATOR.

FIG. 40. PLAN, BACKUS HOSPITAL, NORWICH, CONN.

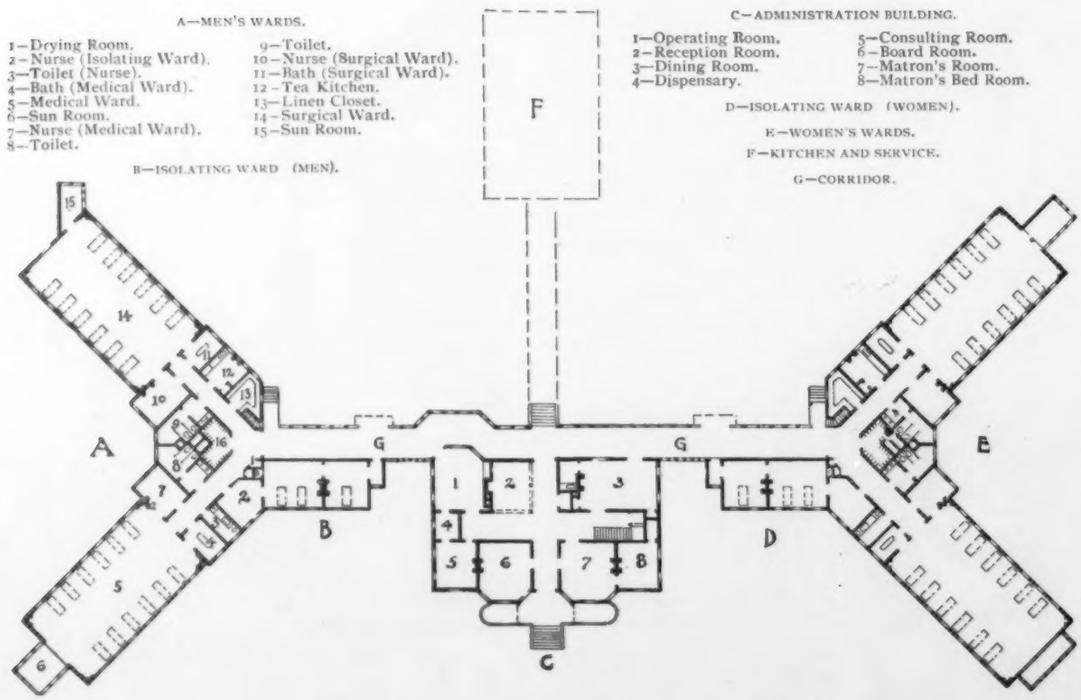


FIG. 42. PLAN, CITY HOSPITAL, SPRINGFIELD, MASS.

FIG. 41. CITY HOSPITAL, SPRINGFIELD, MASS.
E. C. Gardner, Architect.

vaulting a skeleton of brick was first laid and concrete deposited around the same, and that fundamentally reliance was placed upon the inert mass and weight of the material reinforced by enormous buttressing rather than upon mere cohesion or tensile strength. Only rarely are such conditions possible in modern work. Never are they practicable in a modern office building. Settlements or slight movement in the frame of a building which would badly crack and render insecure a reinforced concrete floor construction would simply wedge more tightly together the members of a terra-cotta arch. There must of necessity be a certain amount of elasticity in the filling of a steel frame structure, and this elasticity cannot logically or practically be obtained by the use of any material on the market except terra-cotta.

DEVELOPMENT BY MISTAKES.

A PROMINENT architect some time since made the assertion that the profession was working itself out of commissions in one sense by building modern buildings in such enduring form, and that in a comparatively few years our large cities would be fully supplied with commercial buildings for several generations hence and the architects would find themselves minus employment in those particular lines. We are interested in noting that Mr. Edward Atkinson, in a paper read before the International Fire Prevention Congress at London, presented the point that what may be called unsafe methods of construction have been both necessary and expedient in the progress of the development of the country, and that more permanent buildings which would have absorbed a much greater part of the small capital available would have been an encumbrance rather than a benefit. Our belief, however, is that good construction and good architectural methods have never been helped on the one hand by poor or inefficient construction of any sort and that architects have very little to fear from building too well. The good construction of to-day may be out of date and rejected in a very few years but we can not feel that there is any likelihood of the profession working itself out of a job by building too well, nor can it be assumed that because progress is to be made towards a higher state of perfection a poor building to-day can be in any sense justifiable. We learn a great deal from our failures, but we learn more from our intelligent well-directed successes.

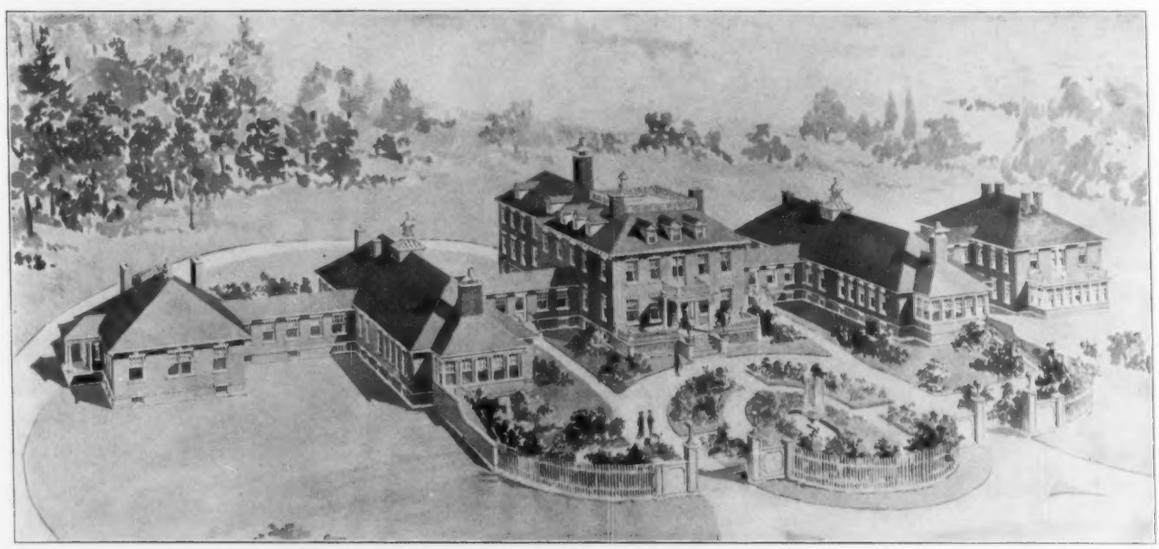


FIG. 43. BURBANK HOSPITAL, FITCHBURG, MASS.
Kendall, Taylor & Stevens, Architects.

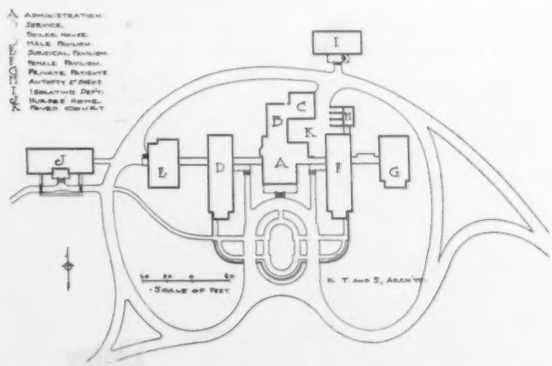


FIG. 44. PLAN, BURBANK HOSPITAL, FITCHBURG, MASS.

Brickbuilding in Normandy.

BY JEAN SCHOPFER.

I CONTINUE my journey through the provinces of France for the benefit of the readers of THE BRICKBUILDER.

In March we visited Toulouse and saw its monuments in brick that range from the eleventh century to the nineteenth, almost without interruption. To-day we will stop in Normandy. *Paulo minora canamus.* The monuments that we shall visit are of less importance than those of Toulouse, but they are nevertheless interesting as examples of brickbuilding. Several of them are even excellent models that one cannot recommend too highly as subjects for the meditation of architects who employ bricks as material for their buildings.

There are two things to be considered in brick architecture.

In some cases bricks are employed to fill up the space between chains of white stone. One obtains in such a manner a very pretty effect from the red color of the bricks and the white of the stone, but these effects have been used to excess, especially in France. Besides, one must remark that brick employed in this way offers no interest to the architect who wishes to learn the special treatment of bricks, as it could be replaced by any other material for filling up.

On the other hand, bricks have been often employed by people who have not tried to reproduce, by the aid of bricks, methods of construction special to stone, but have used them for original work. I will cite, for example, in modern building the Lycee Lakanal, near Paris, built by M. de Baudot, of which I wrote two years ago in THE BRICKBUILDER. Here the decoration is precisely the outcome of a rational and architectural use of brick. The fact that one must keep in mind is that bricks are a material of a small size, as they generally measure eight inches by four and two inches thick. Consequently they are admirably fitted for taking certain architectural forms and refuse to take others; they can be made in four or six tones of color, varying from light yellow ochre to the darkest brick red, and also can be enameled. All this being established, it is easy to see that good brick architecture must be original and must not imitate the ways and fashions of stone architecture.

These facts were well understood in Normandy in the sixteenth century, and excellent decorative effects were produced by bricks employed architecturally, besides having all the resources of coloring that bricks offer the builder.

THE BRICKBUILDER has already published several articles on Norman castles of that epoch. I wish to-day to draw the attention of its readers to some more unpretending monuments, that are nevertheless of great interest to us on this special point. I mean the brick pigeon houses that we still find often in Normandy. The one at Boos has already been reproduced in THE BRICKBUILDER. Those that I give to-day are more important. They belong to the manor of Ango at Varengeville, near Dieppe, and to

FARM BUILDINGS OF MANOR OF ANGO.

the one of Ste. Marguerite. Both of them are of the sixteenth century.

Pigeon houses in ancient France had a special meaning. Only nobles had the right to keep pigeons, and consequently to build pigeon houses to shelter them. The middle and the lower classes had no right to raise pigeons or to kill those which belonged to the nobles. These, on the contrary, were allowed to raise as many as they chose, and their pigeons lived on the crops and corn belonging to their serfs and vassals. There is a fable of La Fontaine on this subject.

For us to-day this fact remains, that wherever we find an ancient pigeon house we are certain that it belonged to a lord of the manor, that it was built by those who had the power and the means to build in the most "approved style," as the saying is.

The first of these pigeon houses belongs to the manor of Ango at Varengeville. Ango was one of the greatest shipowners of the sixteenth century and possessed one of the largest fortunes of France at the time when

Dieppe was the most important French port on the Atlantic coast. Havre had not yet been founded, since it dates from Francis the First. Ango had a large mansion at Dieppe and a country house at Varengeville, five miles from Dieppe. He chose for the site of his country house such a lovely cliff, southwest of Dieppe, that one of our greatest modern landscape painters, Claude Monet, has reproduced it again and again in his pictures.

The Normandy farms have always been renowned for their beauty. They are built in a large square space, always surrounded (nowadays also) by a shallow moat, where there is now no water, and by a low bank on either side of which are planted four or eight rows of forest trees, which form an almost impenetrable bulwark against the high winds from the sea. The center of the square space is occupied by the orchard, with apple and pear trees; the cattle feed there all day long. The farm and buildings belonging to it occupy the middle of one of the sides of the large square space. In the Middle Ages the moat, the embankment, the trees made a kind of fortification, behind which the people living in the farm were sheltered from tramps and from the bands of armed men who lived by pillage and violence.

Such is the plan of the manor of Ango, of which we give two views. The whole is shut in as described above. The buildings and the farmhouse itself form a large square whose entrance doors can be easily defended. Architecturally the manor of Ango was constructed, as far as the farm itself is concerned, with a wooden framework. It is an excellent specimen of that style of building, which has been imitated so very widely and poorly too in contemporary English rustic architecture, where the wooden beams are merely decorative, whereas in ancient times they were the frame itself supporting the house.

The dwelling part of it was constructed of bricks and stone. The bricks were often enameled to give the most charming effect of color and picturesqueness. On the ground floor a hall in form of an open loggia, with round arches borne by columns and pilasters and with medallions, shows the penetration in Normandy of the Italian Renaissance. The steep roofs are always admirable and adapted to the necessity of a rainy climate.

PIGEON HOUSE OF MANOR OF ANGO.

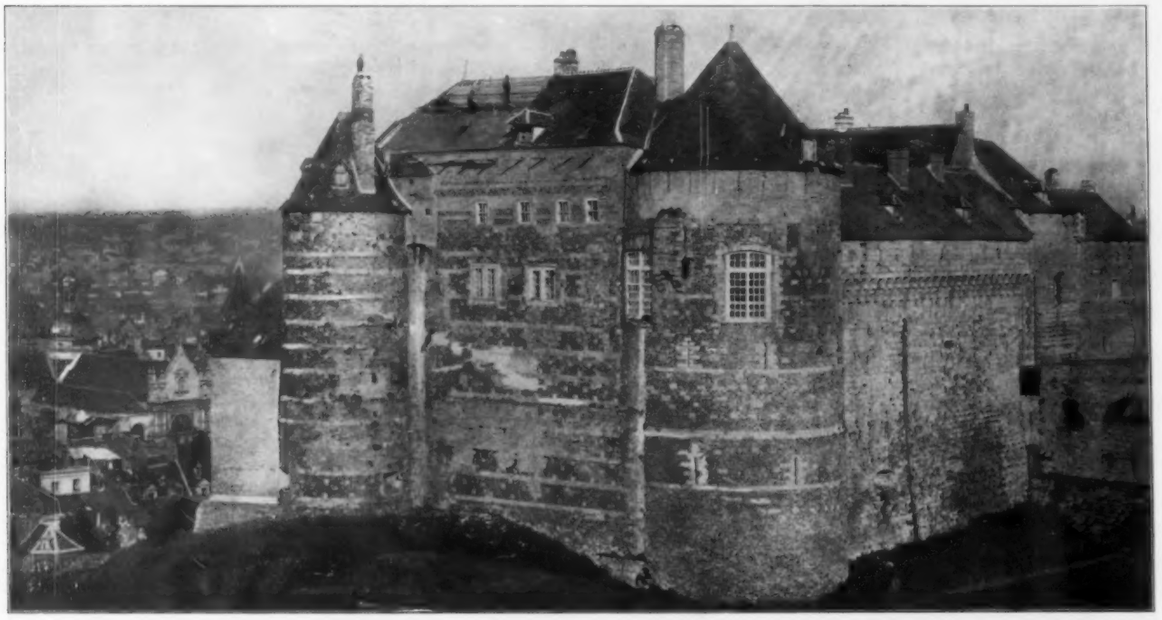
The second plate gives us an exact view of the pigeon house, which is the finest pigeon house in brickwork that has been preserved of that epoch.

It has been classed, as well as the one of Ste. Marguerite, which we also reproduce, among the historical monuments of France, which are placed under the supervision of the architects of the state, who have the care of their preservation.

It is a model and an epitome of the different ways of combining bricks architecturally and decoratively. The basement is in red bricks placed flat; then comes a band of lozenges whose center is a square white enameled brick. A cornice protects the basement, then a line of squares arranged as on a chessboard, then a band of flat bricks, then again a line of white lozenges framed in dark

ones, these being formed by four bricks showing their ends only, then flat bricks placed so as to let air penetrate into the interior of the pigeon house; then again a new and narrower line of lozenges surmounted by a row of bricks placed corners outward that gives strong relief to the whole and constitutes a decoration that is peculiar to brickwork. The cornice supporting the roof is very elaborately decorated.

The architects who wish to employ bricks cannot study too carefully the different ways in which bricks have been employed in this pigeon house of the Ango manor. The variety and ingenuity displayed are wonderful, and always the decorative effect is produced, not artificially, but by the way the brick is used architecturally. That is the rule of all good architecture, too often forgotten, alas! in modern times.



THE CASTLE OF DIEPPE.

THE CASTLE OF DIEPPE.

The pigeon house of Ste. Marguerite is not far from Varengeville. It is in a slightly less ornate style, but

CHAPEL OF THE COLLEGE D'EU.

UNIV OF MICH

nevertheless of excellent brick construction and beautiful decorative effect. There is a stone doorway of the Renaissance period which contrasts unfavorably with the brickwork. It is still used as a pigeon house.

THE BRICKBUILDER has published already the pigeon house of Boos. With these three buildings its readers have the most interesting monuments of this type that exist in France.

Nobody builds pigeon houses in our time. Architects will not therefore be tempted to copy those that we reproduce; but they can study to their great advantage the remarkable way in which bricks were used at the end of the Middle Ages and in the first times of the Renaissance. They will learn there and understand all the numerous resources that bricks offer to those who know how to use them.

I give also a picturesque *ensemble* of the old manor of Turpes, at Bures, same county. It is of the sixteenth century, and has become a farmhouse now. It is built in brick, with very handsome wooden framework, with an open gallery, often seen in Swiss *chalets*, but rarely in France.

PIGEON HOUSE OF STE. MARGUERITE.

The Castle of Dieppe, of which I give two views, is also a most picturesque *ensemble*. It is of the fifteenth century, and is classed as an historical monument. It is high above the town. The houses are grouped around it. It was a strongly fortified place, which had to bear many assaults. The castle is built mostly in bricks, whilst horizontal lines of white stone separate the flat spaces of brickwork in a fashion picturesque and original enough to be noticed.

Lastly, there is another historical monument in the same county, also in brickwork, but of a very different style. It is the chapelle of the College d'Eu. It belongs to the seventeenth century. It is of the purest *jésuite* style, and the different orders in stone triumph on the brick façade. According to the rules of Italian Renaissance, each story has a different order, first the Doric, then the Ionic, then the Corinthian, the whole being crowned by those consoles which Leon Battista Alberti was the first to employ, in the first half of the fifteenth century, at Santa Maria Novella, in Florence, and which since then have had such an immense and deplorable success in architecture.

Such are the monuments in brickwork in this part of Normandy which to-day constitutes the department of the Seine-Inférieure. We find them worthy of being placed under the eyes of the readers of THE BRICKBUILDER.

OLD MANOR OF TURPES AT BURES.

Fireproofing.

THE 25th of January, 1904, was a memorable day in the history of Chicago, so far as concerns the protection of human lives in buildings. The two most important events were the verdict of the coroner's jury, fixing the responsibility for loss of life in the burning of the Iroquois Theater, and the passage of a resolution by the Board of Education providing that all schoolhouses hereafter erected shall be of fireproof construction throughout. On the same day also the City Council made its final corrections to the new theater ordinance which had been adopted one week previously, and fixed new conditions according to which the theaters, all of which had been closed for three weeks, might be reopened. At the same meeting of the City Council an amendment to the building ordinance was adopted in which it is provided that *all elevators* in existing non-fireproof buildings must have fireproof enclosures and doors, excepting only those in buildings which are equipped throughout with automatic sprinklers. This exception will leave out some of the largest and newest department stores and many wholesale stores which are thus equipped.

On account of the great prominence given by the daily papers to the verdict of the coroner's jury, the other important acts have attracted little attention. The verdict placed the blame on the president of the theater company and several of its employees, the mayor of the city, the Building Commissioner and one of his inspectors, and the chief of the fire department. The mayor has already been vindicated by order of one of the courts, and the chief of the fire department may escape on a technicality. The Building Commissioner and the theater management will probably have to take the whole responsibility. The architect and builders of the Iroquois Theater were not mentioned in the verdict.

THE week previous to January 25 was also remarkable for an instructive fire test at Chicago. A very severe fire occurred on the fifth floor of the Masonic Temple. This building, rated at three hundred and sixty feet high, was when erected the highest building in the world, but has since been exceeded in this respect by several in New York. It was erected in 1891, and is the first building in which fifteen-inch end pressure arches were used in the floor construction. These are of dense hollow tile made by the Pioneer Fireproof Construction Company, and of spans about eight feet. They have side pressure skewbacks. The fire occurred in a suite of rooms occupied as a laboratory and salesroom for X-ray apparatus. All the windows of this suite faced upon State and Washington streets, and as they were on a corner, the only exposure on the interior was a large double door with fanlight, set anglewise on the corridor around the great central court. The fire was sudden and spectacular, and poured out of all the windows on the street side. The only damage on the corridor side was the breaking of glass in the fanlight. The fire was confined to the rooms in which it started, and all the other damage was caused by water. It is enough to say that the hollow tile partitions and floor arches above prevented the spread of fire in every direction, though the contents of the rooms were almost completely consumed. A few of the bottoms of the ceiling arches were flaked off, and that was all the damage to the fireproofing. While the fire was not so high up as to prevent the fire department from operating on the outside, it was some time before the mechanical standpipe was used from the street. The outside of the Masonic Temple is of gray fire brick, and such trimmings as were used are of terra-cotta. Only a few chips were flaked off from the latter. This has been one of the best illustrations of effective fireproof construction that Chicago has experienced.

THE INFLUENCE OF BUILDING LAWS ON FIREPROOF CONSTRUCTION.

ANY one who has carefully studied the building laws of our large cities must acknowledge that in nearly every instance the scientific development of fireproofing methods has been injured rather than helped by legislative or municipal enactment, the building laws having invariably lagged several years behind the scientific development. It is hardly too much to say that most of the improvement which has been brought about in fireproofing methods has been to a very considerable extent in conflict with at least the letter of existing laws. This is a natural condition and would not of itself necessarily imply any injury to the cause of fireproofing, but unfortunately few of our building law makers have been men possessed of sufficient technical knowledge to enable them to so draw up an enactment that it cannot leave loopholes for poor or vicious construction, and the results have certainly been in some of the cities that the minimum requirements which will satisfy the inspectors make it possible for some extremely unscientific methods to be accepted. The building market is at present filled with a great assortment of so-called fireproofing constructions depending upon the use of concrete. No one will seriously question the fact that under some conditions concrete can be used safely, economically and with due regard to fire protection, but on the other hand there are many forms of concrete construction which no disinterested engineer would for a moment class as fireproof or scientific and yet which will comply with the letter of the law in most of our large cities. For example, a fundamental principle of fireproofing is that structural steel shall be protected by a direct covering of some nonconducting material. In some of the recent buildings we have known of a construction which included simply bare steel beams with a 3½-inch concrete slab continuous across the tops of the beams and a metal lath ceiling suspended below the same. Again, we have seen so-called cinders concrete in which the quality of cinders was such that the compound could actually be set on fire. So long as the building laws let down the bars to pass indiscriminate compounds of concrete mixed by unskilled labor and applied without special supervision, so long will it be possible for buildings to be fireproofed in accordance with the law and yet be thoroughly dangerous as fire risks.

Selected Miscellany and Editorial Comment

DETAIL BY EXCELSIOR TERRA-COTTA CO.
John D. Allen Co., Architects.

CINCINNATI HOSPITAL.

IT is proposed to build a large hospital near Cincinnati, and we regret to say that those having the project in view seem to feel that the proper course to pursue is to "invite the best architects in the country to submit plans." Whether such invitation will be accepted we should very much doubt. The newspaper reports intimate that large prizes will be offered for suitable designs, and then state that "the plans will be the property of the commission, and a composite plan will probably be evolved from them." We sincerely trust that in this respect the newspaper reports are wrong. Such a method of procedure would not call for the kind of response which the people of Cincinnati would expect, and no money prize would be an inducement to many of our leading architects to sell plans from which ideas were to be culled for a so-called composite. The question of competition for a building of this sort is always a hard one to properly meet. The position of the architect is that he does not feel justified in merely scrambling for work, and in nearly every kind of building better results are accomplished by making a careful selection of an architect, and having him study out the problem thoroughly in conjunction with the commissioners. A competition means more or less a snap judgment on the part of the competitors and the judges, and that is not the most satisfactory way to obtain ideal results. We sincerely trust that the newspaper reports are all wrong in this respect, and that the gentlemen who have the project in charge will see fit to either

MEDALLION BY LOUIS POTTER, SCULPTOR.
Executed in Colored Faience by Hartford Faience Co.

DELIVERY ROOM, HUNTINGTON LIBRARY, HAMPTON, VA.

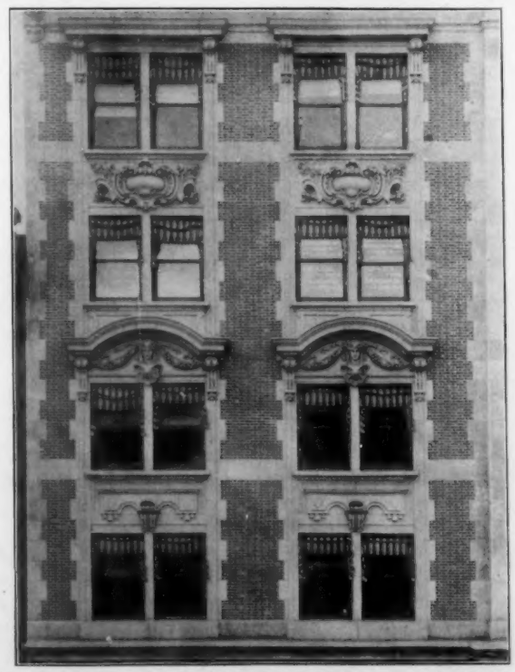
STABLE FOR HOWARD GOULD, ESQ., PORT WASHINGTON, L. I.
View of roof construction showing supporting masonry ribs and hangers from same, partially carrying floor below. Spans about 50 feet. Guastavino construction.

ORPHANS' HOME, CHICAGO, ILL.
Shepley, Rutan & Coolidge, Architects. Terra-Cotta furnished by Northwestern Terra-Cotta Co.

conduct a competition in the manner which has been so wisely recommended by the American Institute of Architects for such cases, or, better yet, to make a deliberate selection of an architect and trust him fully with the work.

PENALTIES FOR DELAY.

A CORRESPONDENT writes us in regard to the possibility of collecting damages or a forfeiture from a contractor for delay in completion of a contract beyond a certain specified time. This is a subject upon which there seems to be a considerable amount of misapprehension on the part of many architects and builders, and there is a legend that decisions of the Supreme Court have held that a forfeiture clause in a contract is invalid unless the contract likewise provides a bounty or bonus for completion of the building or the work before the time specified. As a matter of fact, without the sanction of a properly constituted court no agreement can be made which will enable one party to collect a penalty from another, and if the contract is so worded as to imply that in case of delay the builder is to be called upon to pay a penalty, such penalty can never be legally collected. On the other hand, it has been established, not only by court decisions but by actual practice, that if in advance a certain amount per day or



DETAIL OF FRONT, ALBANY TRUST BUILDING, ALBANY, N. Y.
Terra-Cotta by New York Architectural Terra-Cotta Co.
Marcus T. Reynolds, Architect.

DETAIL BY PERTH AMBOY TERRA-COTTA CO.
James G. Hill, Architect.

DETAIL FOR WINDOW HEAD.
R. Thomas Short, Architect. New Jersey Terra-Cotta Co., Makers.

BATTERY PLACE BUILDING, NEW YORK CITY.
H. J. Hardenburgh, Architect.
Fireproofed with Burnt Clay Tile.

POWERS BUILDING, CHICAGO.
Holabird & Roche, Architects.
Built of Light Gray Brick, Made by Columbus Brick and Terra-Cotta Co.

per week shall be agreed upon as constituting the actual damages which the owner would sustain from delay, and the amount of such damages is properly incorporated in the written contract, signed by both parties, such damages can be collected, and it is in nowise necessary that there should be a corresponding bonus for completion of the work in advance. It is entirely a matter, not of penalty, but of damages. It is often of no value whatever to an owner to have a building completed before a certain date, while any delay beyond that time might entail serious pecuniary loss. It does not at all follow, then, that in equity and certainly not in law should a contractor be entitled to a premium unless it is distinctly so stated in the bond. Great care should be taken in framing such a contract that the amount of damages is expressly agreed upon as "in liquidation of actual loss and not as a penalty," and in any case an architect who undertakes to put such a clause in a contract should not fail to first obtain the best legal advice upon the subject.

DETAIL BY CONKLING-ARMSTRONG TERRA-COTTA CO.
Snelling & Potter, Architects.

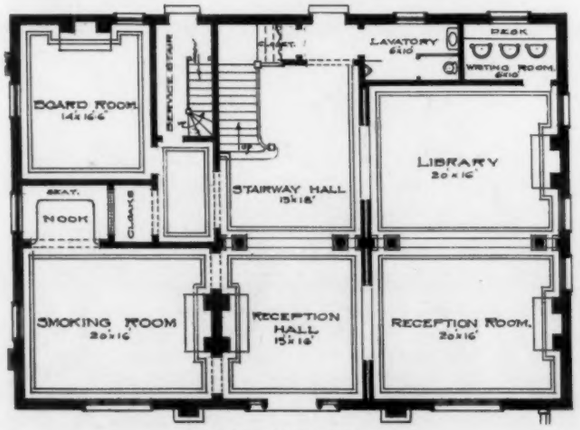
DETAIL BY ATLANTIC TERRA-COTTA CO.
Augustus N. Allen, Architect.

ENAMELED TILE IN THE BOSTON SUBWAY.

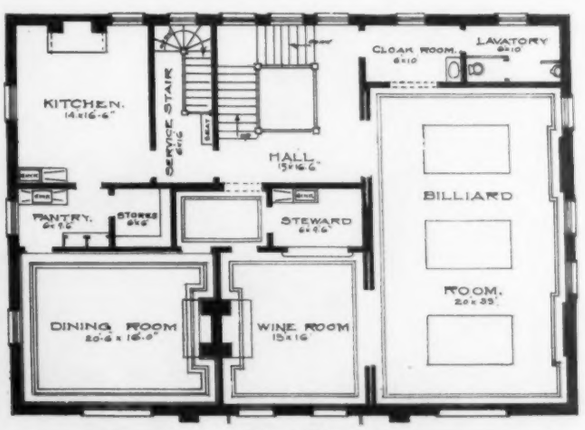
IT is expected that cars will be running through the East Boston tunnel under the harbor by the 1st of August. The walls of the station which has been constructed immediately under the Old State House are now entirely faced with their final veneer of white enameled tiles, and present a very attractive appearance. The roof of this station, which is of concrete, will not be tiled, but will be painted in a soft gray. The arched roof of

the station at Atlantic Avenue, however, will be tiled as well as the walls. Enameled tile and brick have been used in nearly all the stations of the Boston Subway, and with extremely satisfactory results. The tiling has been in place for about five years, and seems to have stood perfectly in every respect. When the subway was under process of construction we expressed in these columns the hope that enameled brick would be adopted for the entire length. The subway commissioners made experiments with a number of materials and finally decided to face the walls with enameled tile at the stations but to paint elsewhere, and the result has shown that nothing but enameled brick can really be kept clean. So long as passengers will use tobacco, and dirt and dust will accumulate, nothing but a clean enameled surface which can be readily washed off will answer for such work. New York seems to be profiting by Boston's experience, and is using enameled brick and tile to a larger extent and with very marked success.

PIEDMONT CLUB, LYNCHBURG, VA. Frye & Chesterman, Architects.



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

PIEDMONT CLUB, LYNCHBURG, VA.

BURNED CLAY FOR BUILDING PURPOSES.

THE rapid growth of our towns and cities in connection with the great prosperity enjoyed during the past few years has largely increased the demand for substantial and comfortable homes and buildings of every description. The almost total extinction of our large

RAILWAY STATION AT CONNEAUT, OHIO.
Folsom Snow Guards used on Roof.

forests, thereby increasing the value of wood, has made it necessary to adopt other products to supply the demand for first-class yet inexpensive materials for building construction.

Among the most essential and important of these products is that of burned clay, which is now used quite extensively in all of the larger as well as in many of the smaller buildings throughout the country, for fireproofing and ornamental purposes, as well as for the foundations and walls of buildings.

Within the past few years the Hollow Block branch of the clay business has grown to very large proportions, and at the present time in the state of Ohio alone — which is the center of production for the United States — there are a number of large plants, equipped with the latest and most improved machinery, employing hundreds of men, producing thousands of tons of these blocks annually.

A booklet has recently been issued by the National Fireproofing Company of Pittsburgh, which describes and illustrates in a most interesting manner the shapes and methods employed in the use of these blocks.

There are also illustrated some thirty buildings, varying in character, which have been constructed of this material. It is a valuable epitome, treating of a new development in structural material.

STOWERS BUILDING, HOUSTON, TEXAS.
Green & Fvarz, Architects.
Faced with American Size White Enameled Brick, made by Hydraulic Press Brick Co., St. Louis.

IN GENERAL.

Frank Miles Day lectured before the Washington Architectural Club at the Octagon, Saturday evening, January 30, on the Park Systems of America.

D. H. Burnham & Co., architects, will on March 15, 1904, move their offices in Chicago from 1142 The Rookery, to 1417 Railway Exchange Building, corner of Jackson and Michigan Boulevards. Permanent telephone, 4145 Harrison.

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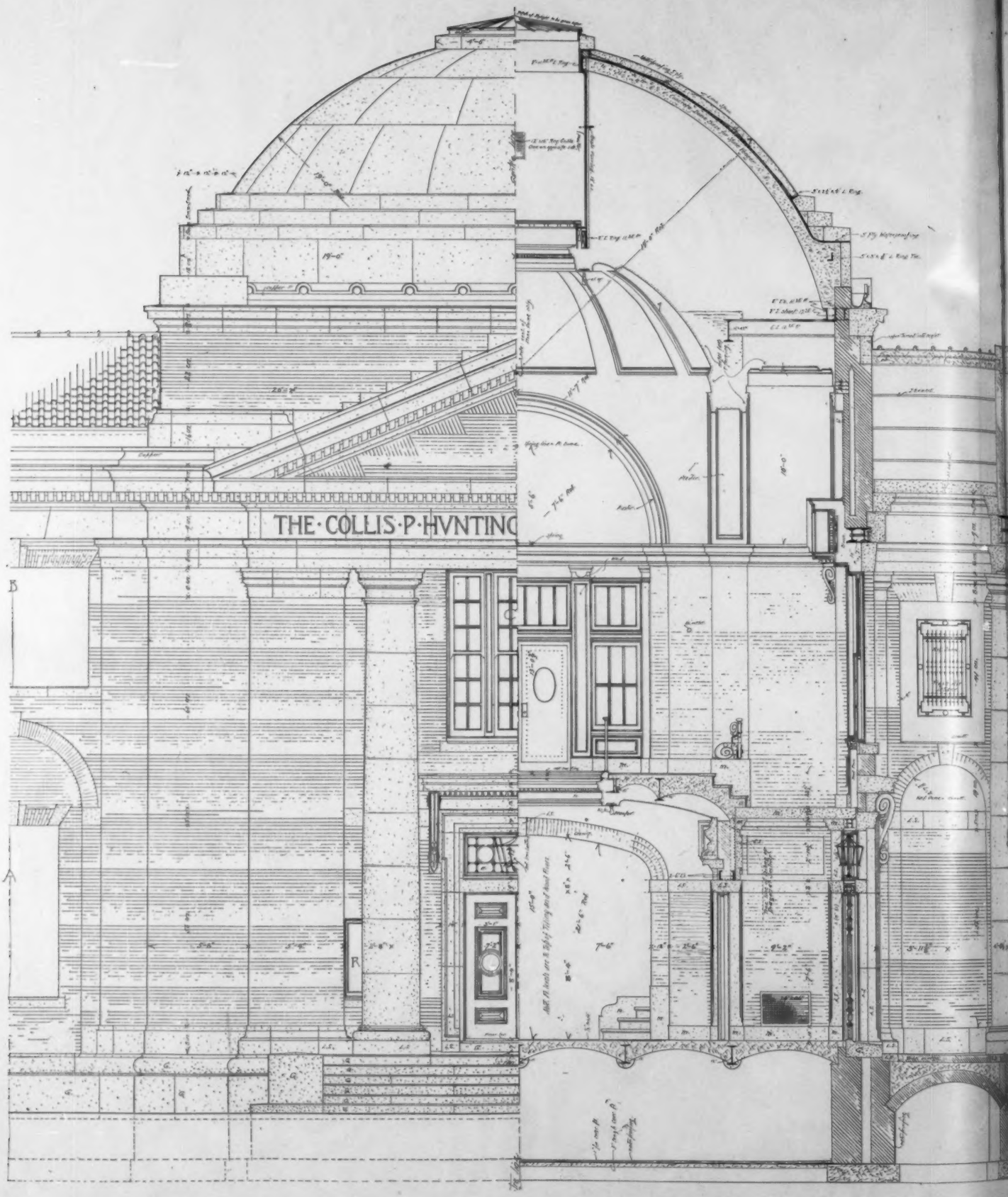

HALF ELEVATION OF CENTRAL PAVILION.

THE COLLIS P. HUNTINGTON MEMORIAL LI
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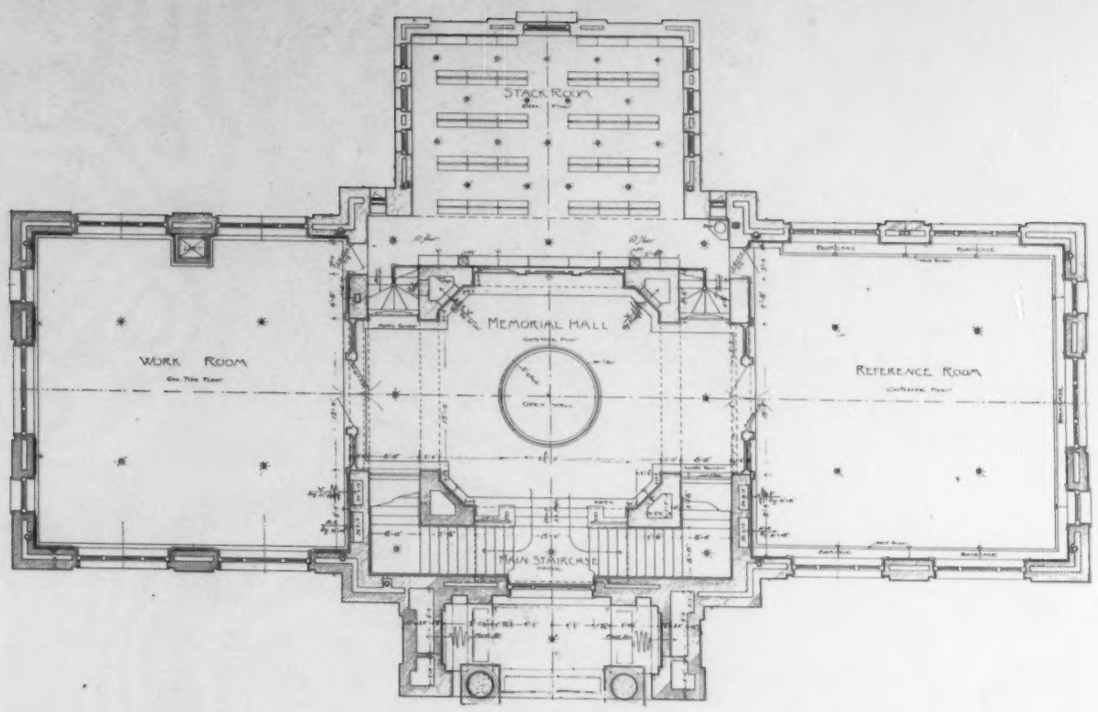

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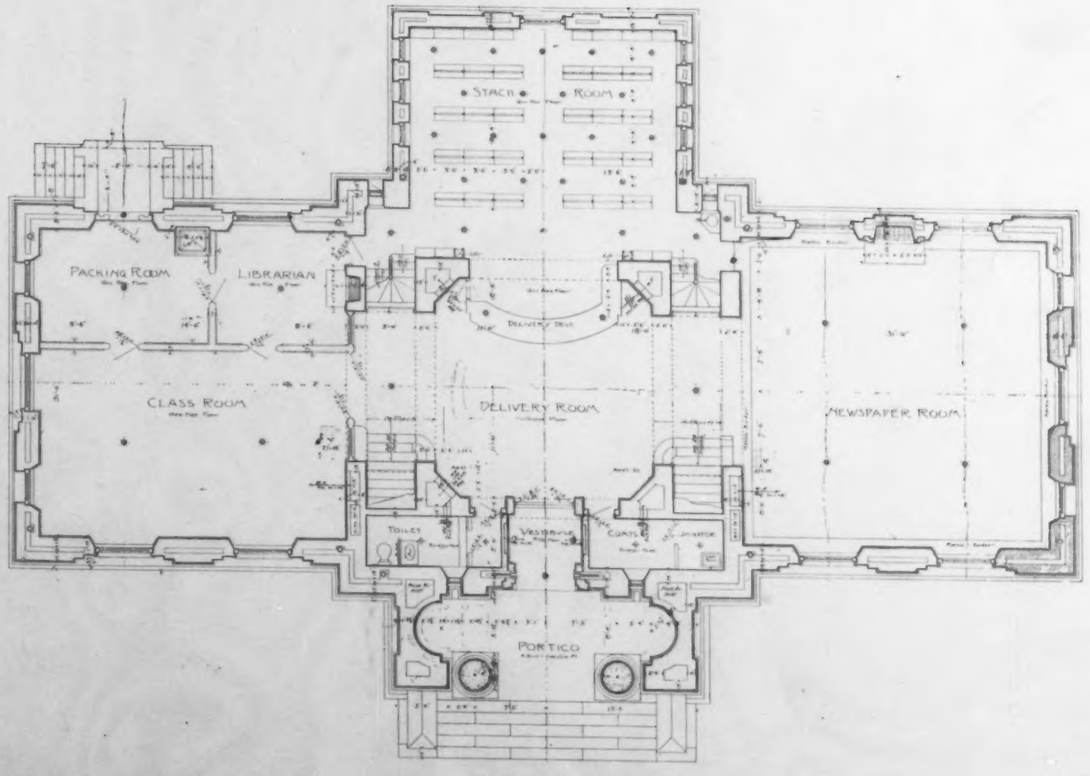

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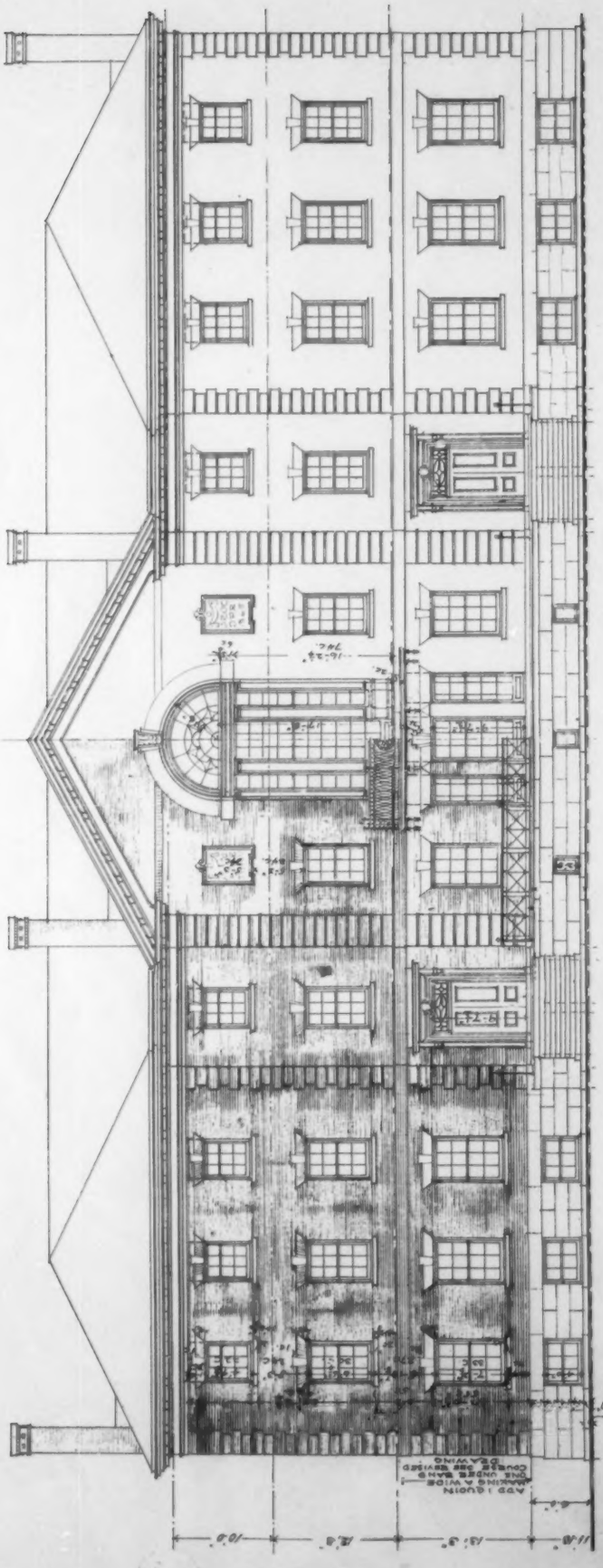

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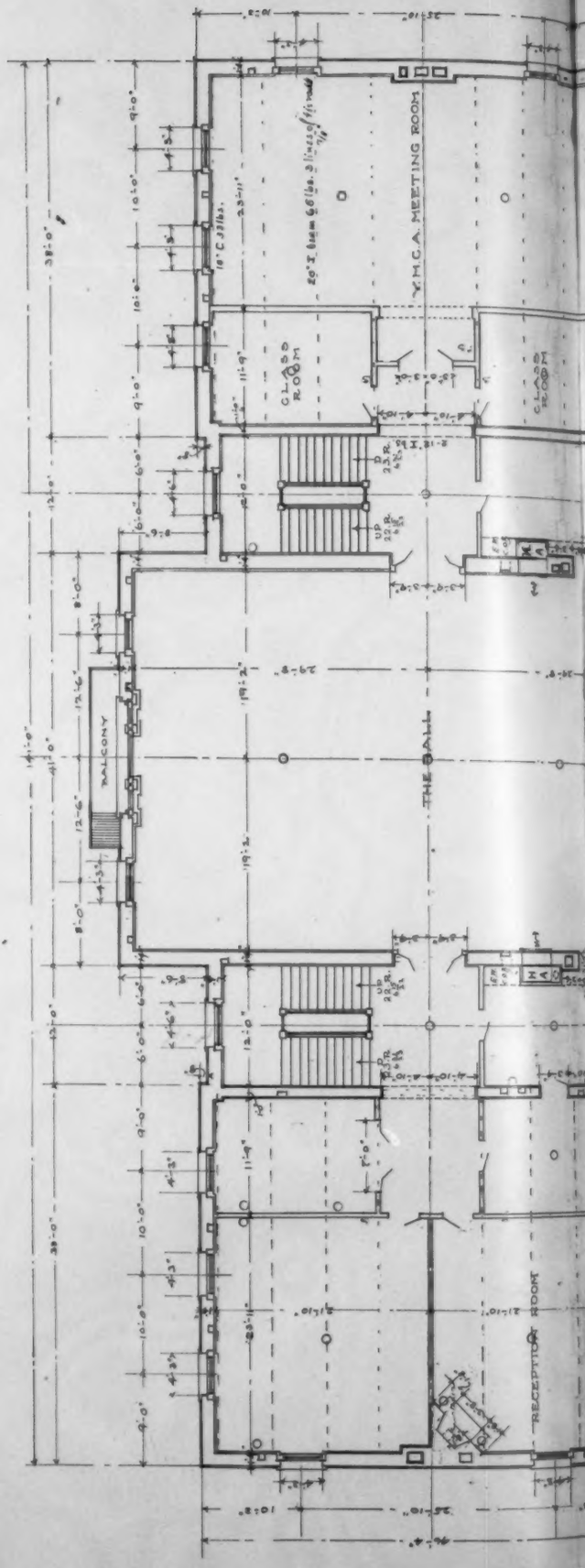

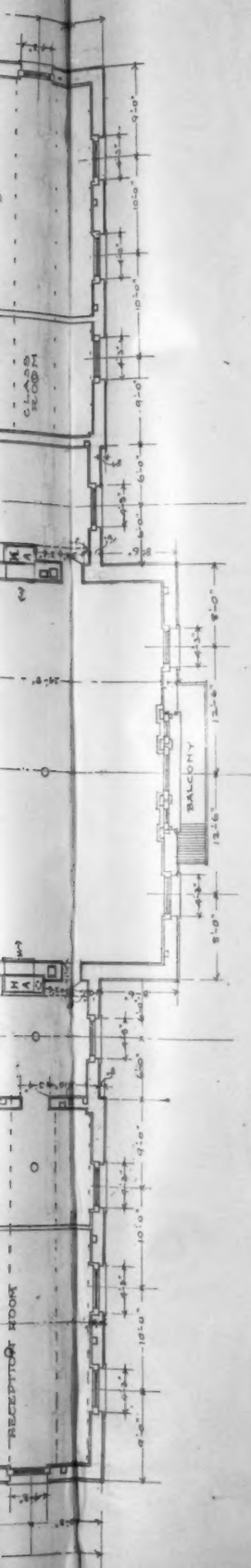

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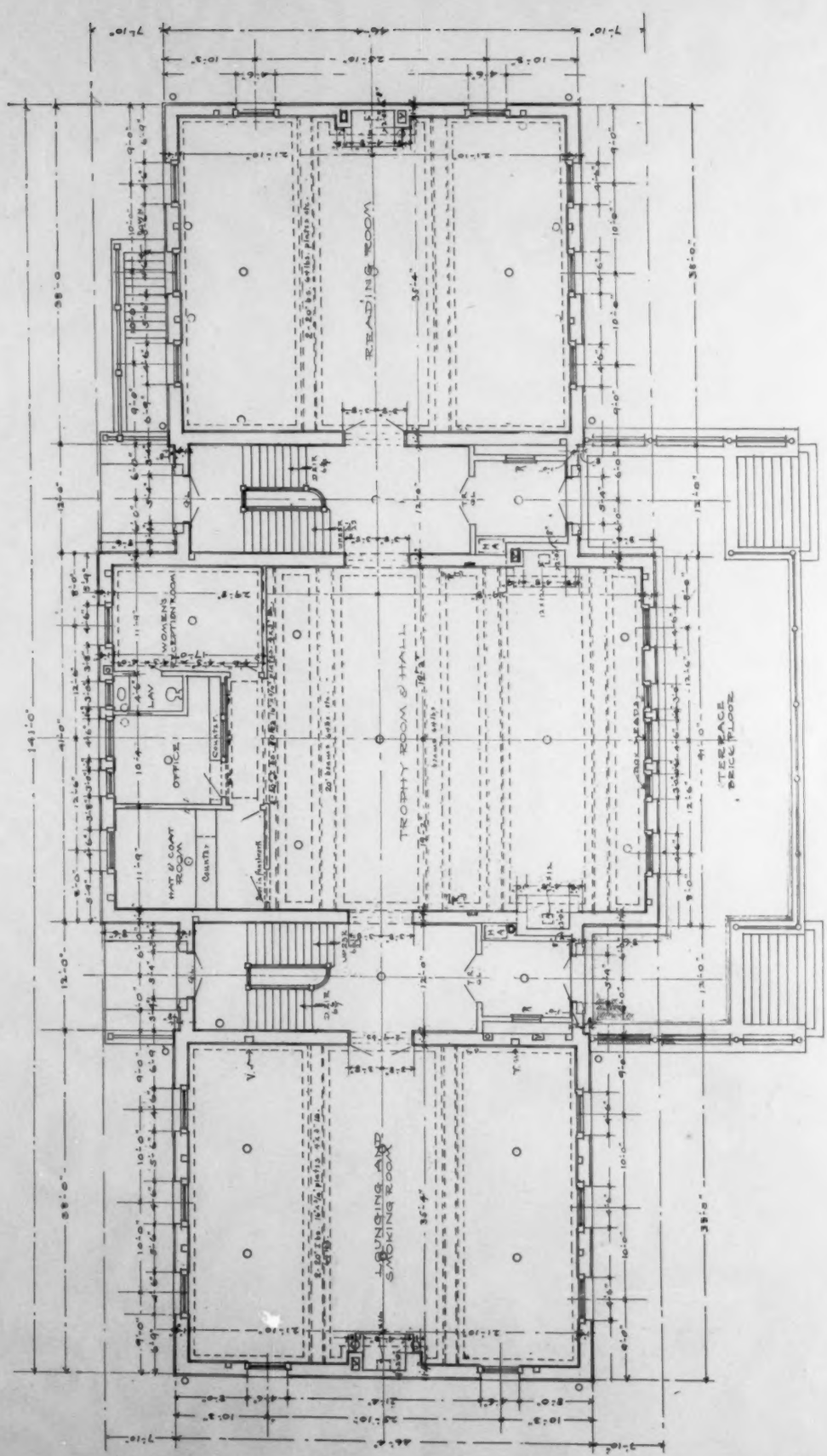

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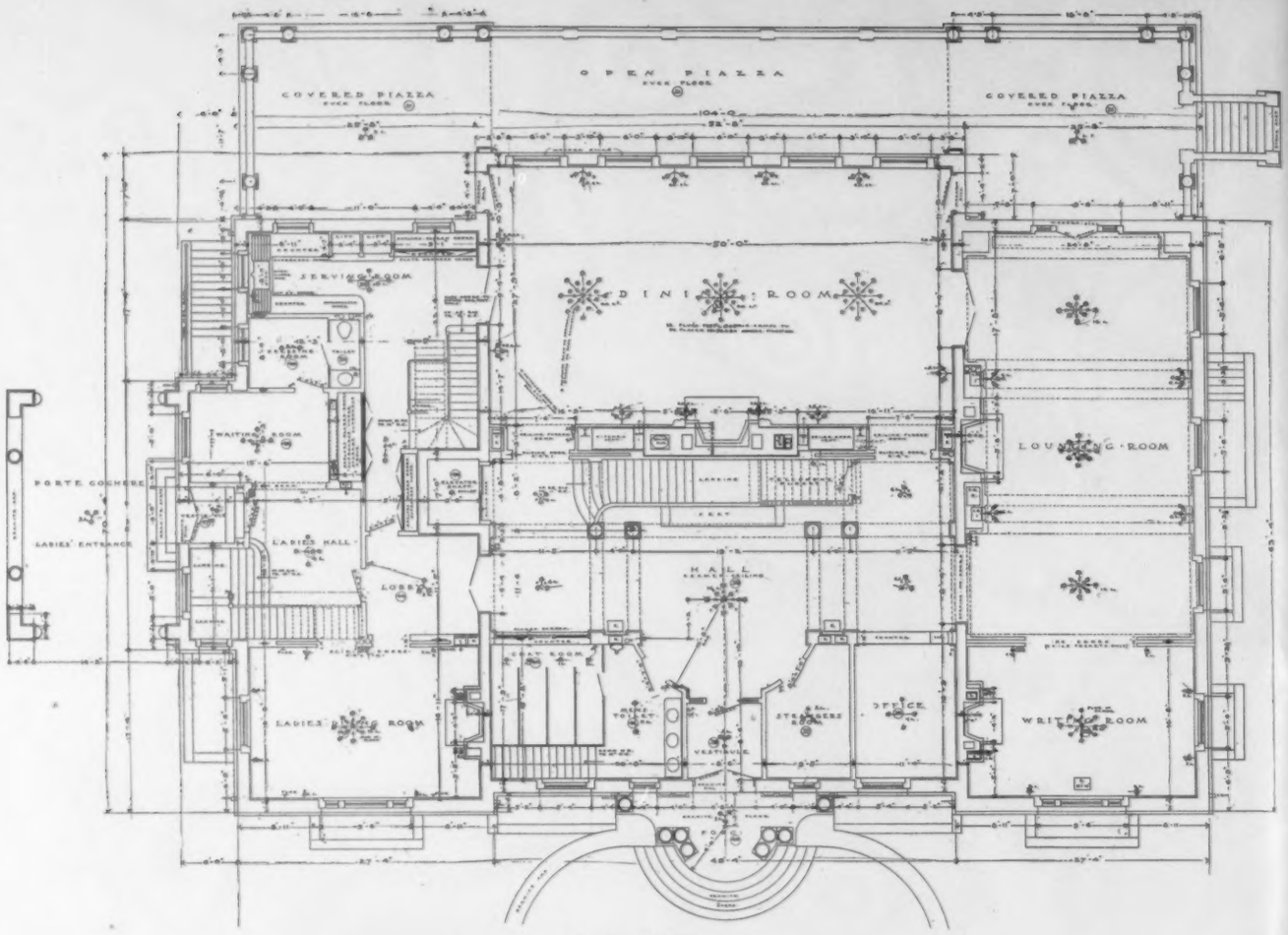

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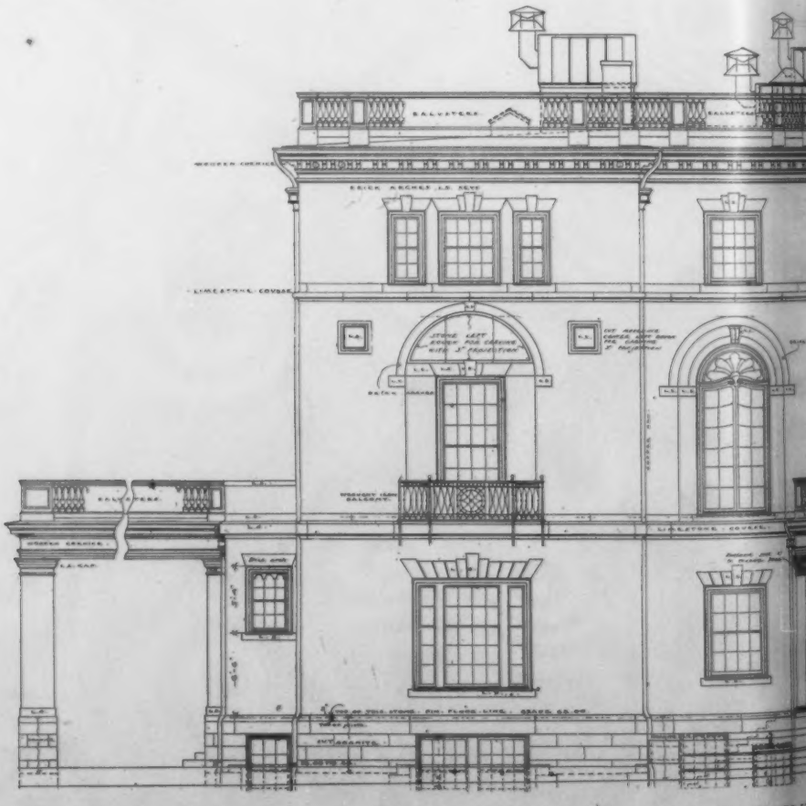

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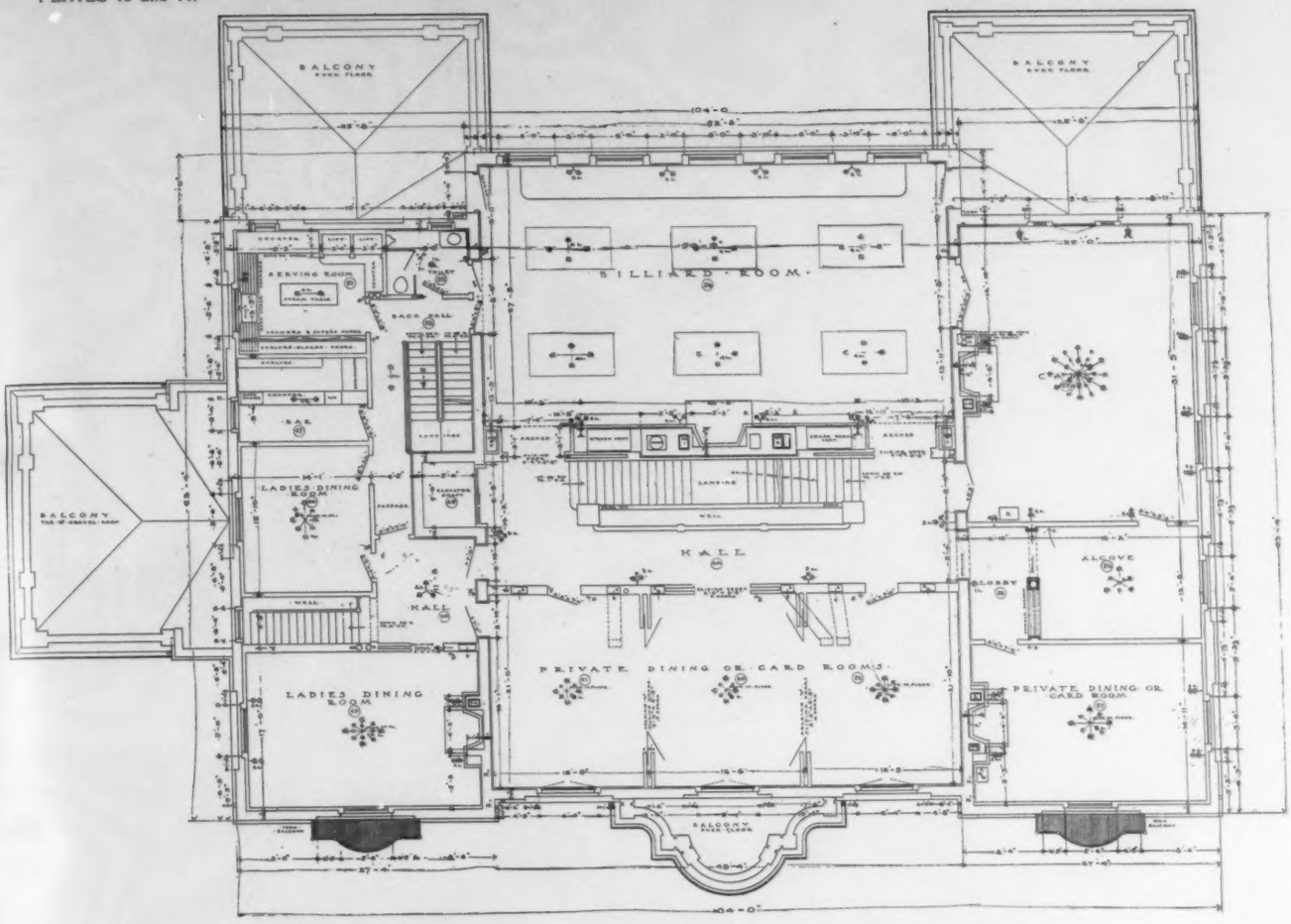

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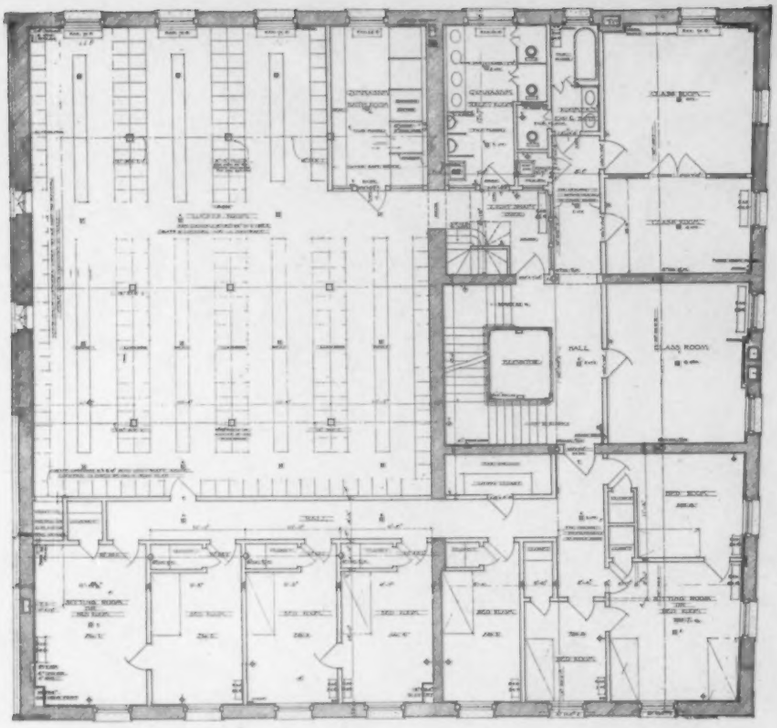

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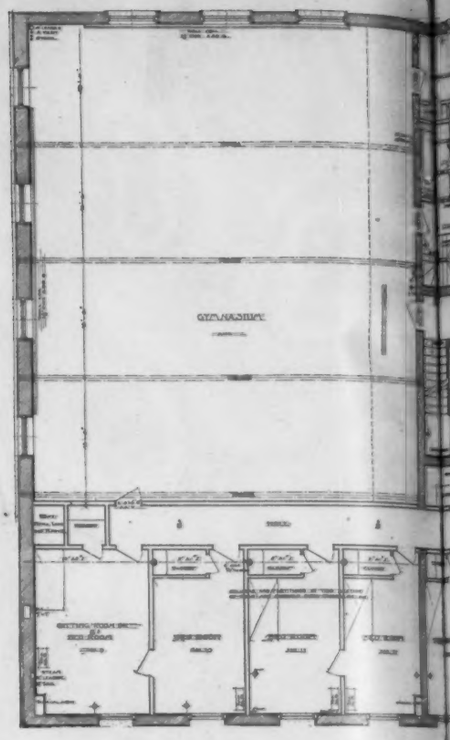

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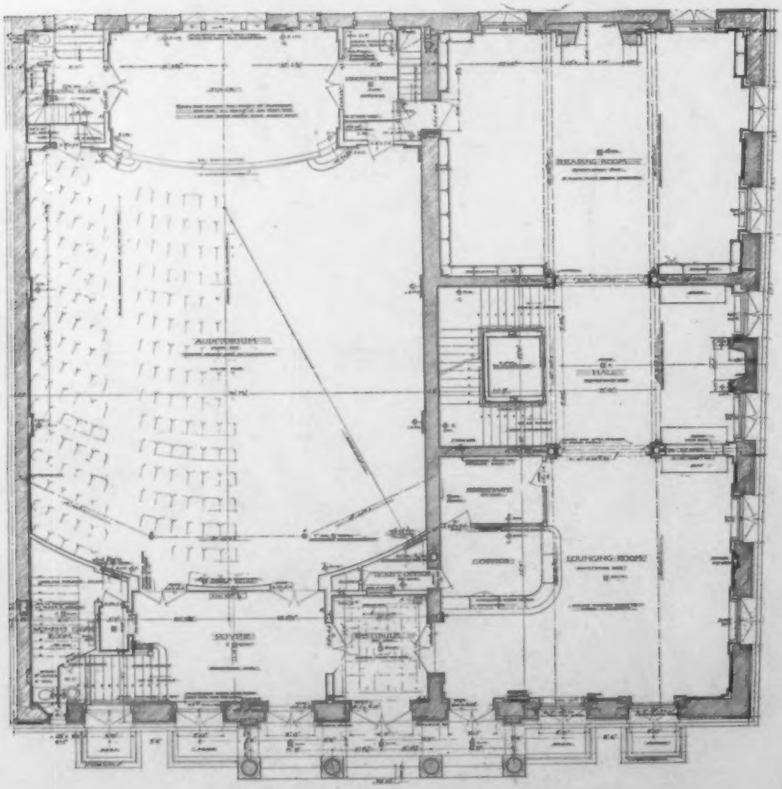

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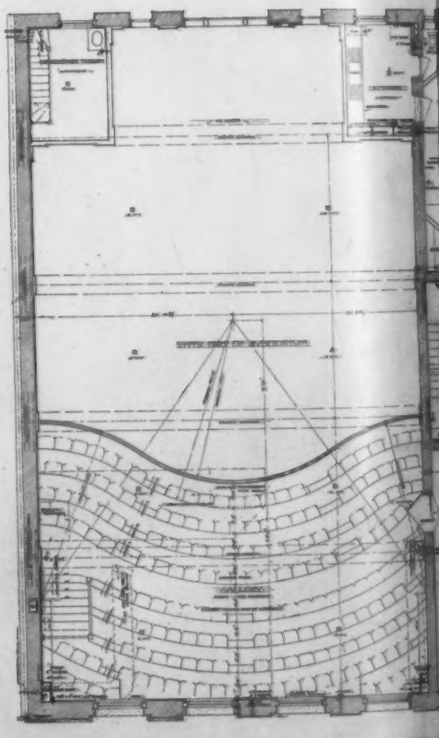

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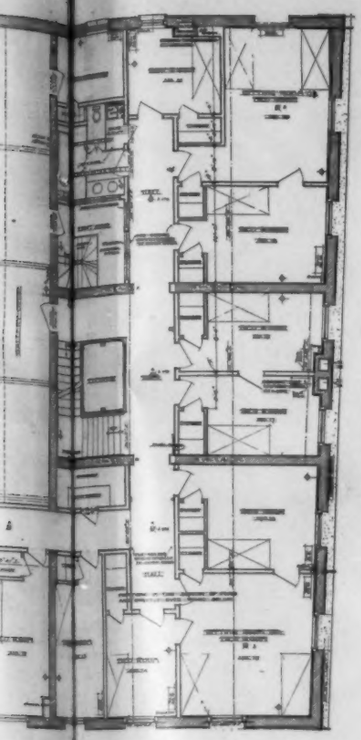

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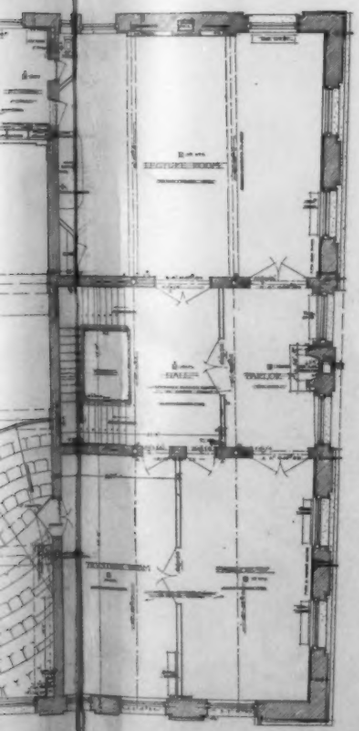

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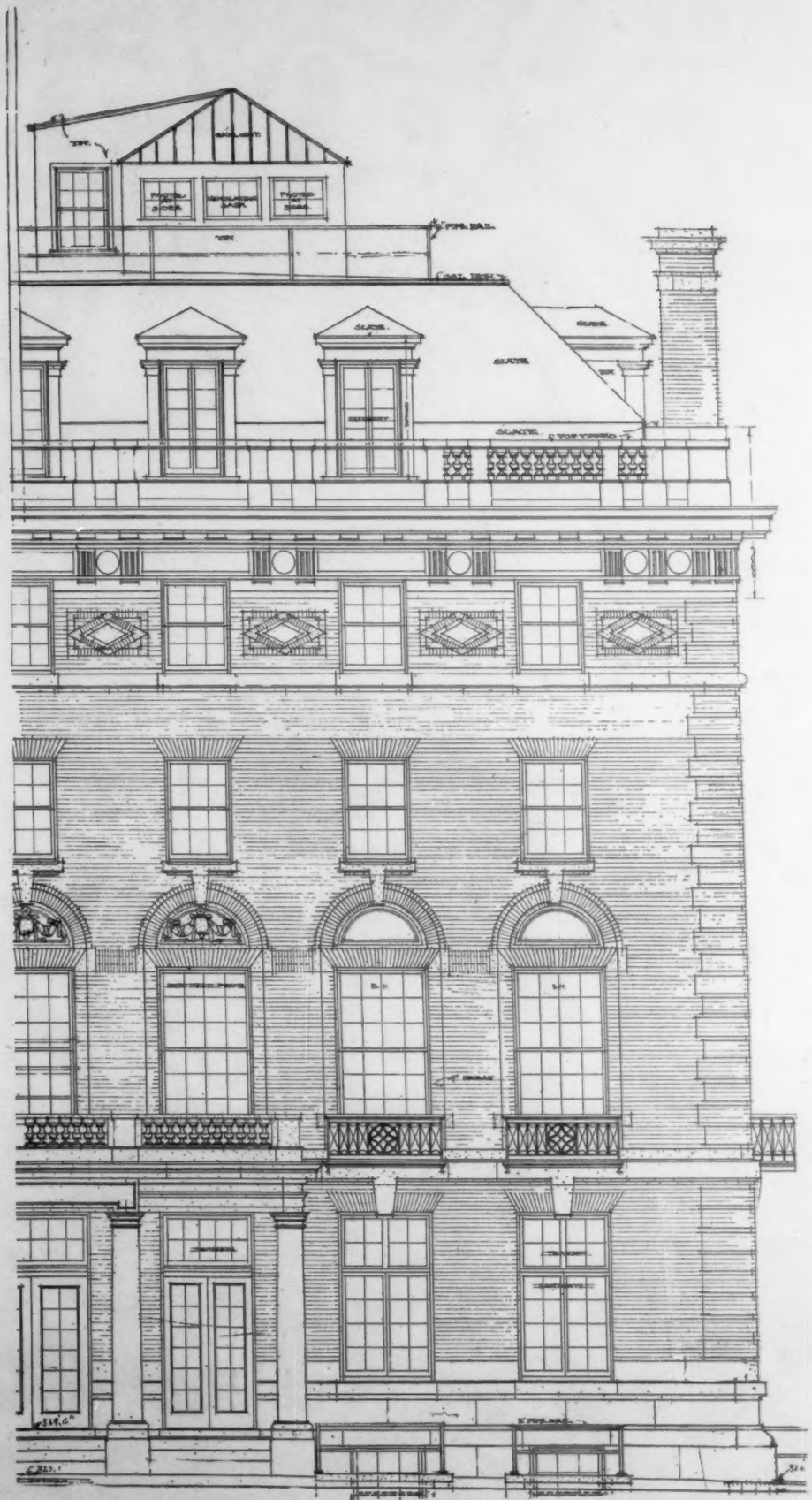

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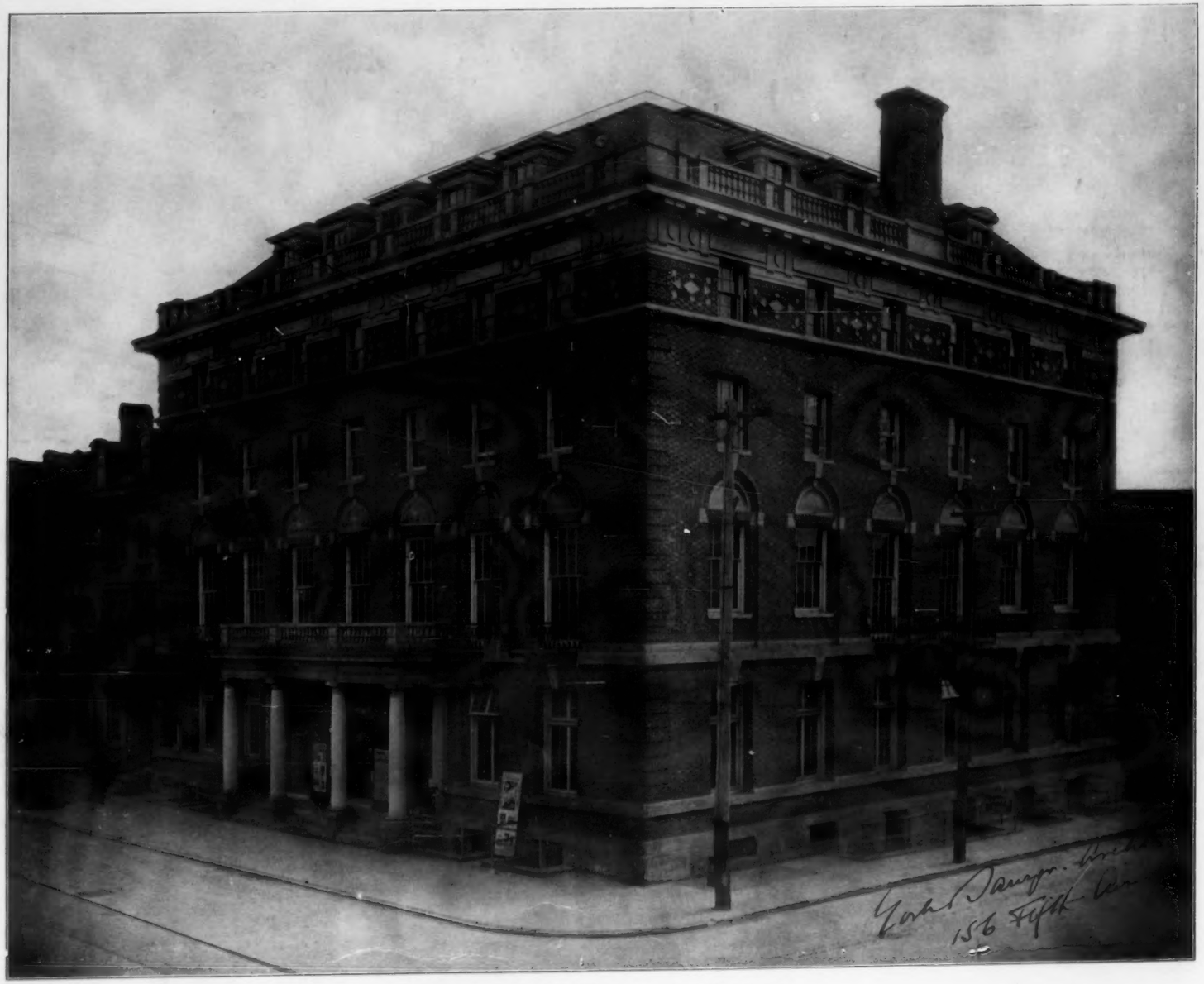

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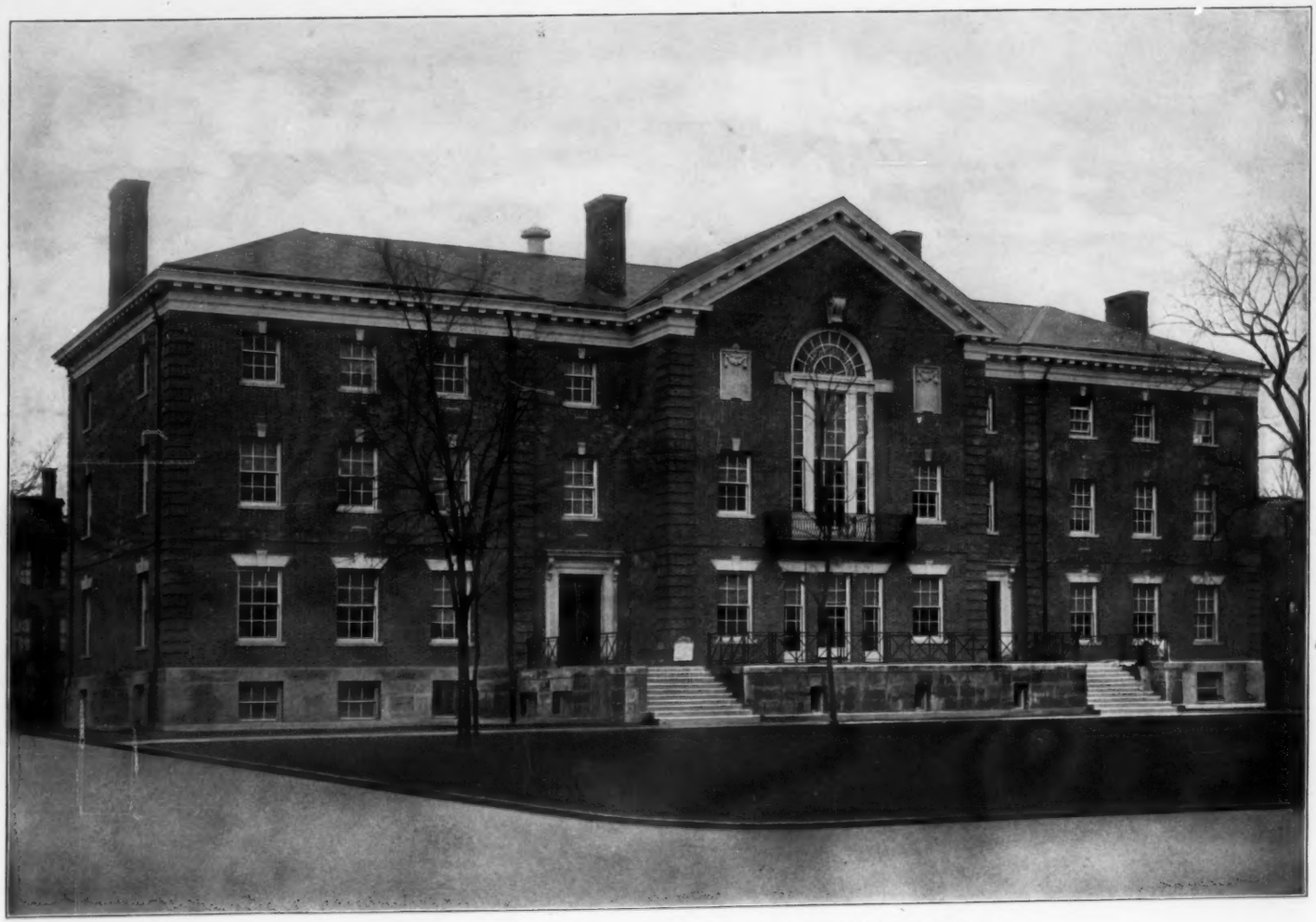

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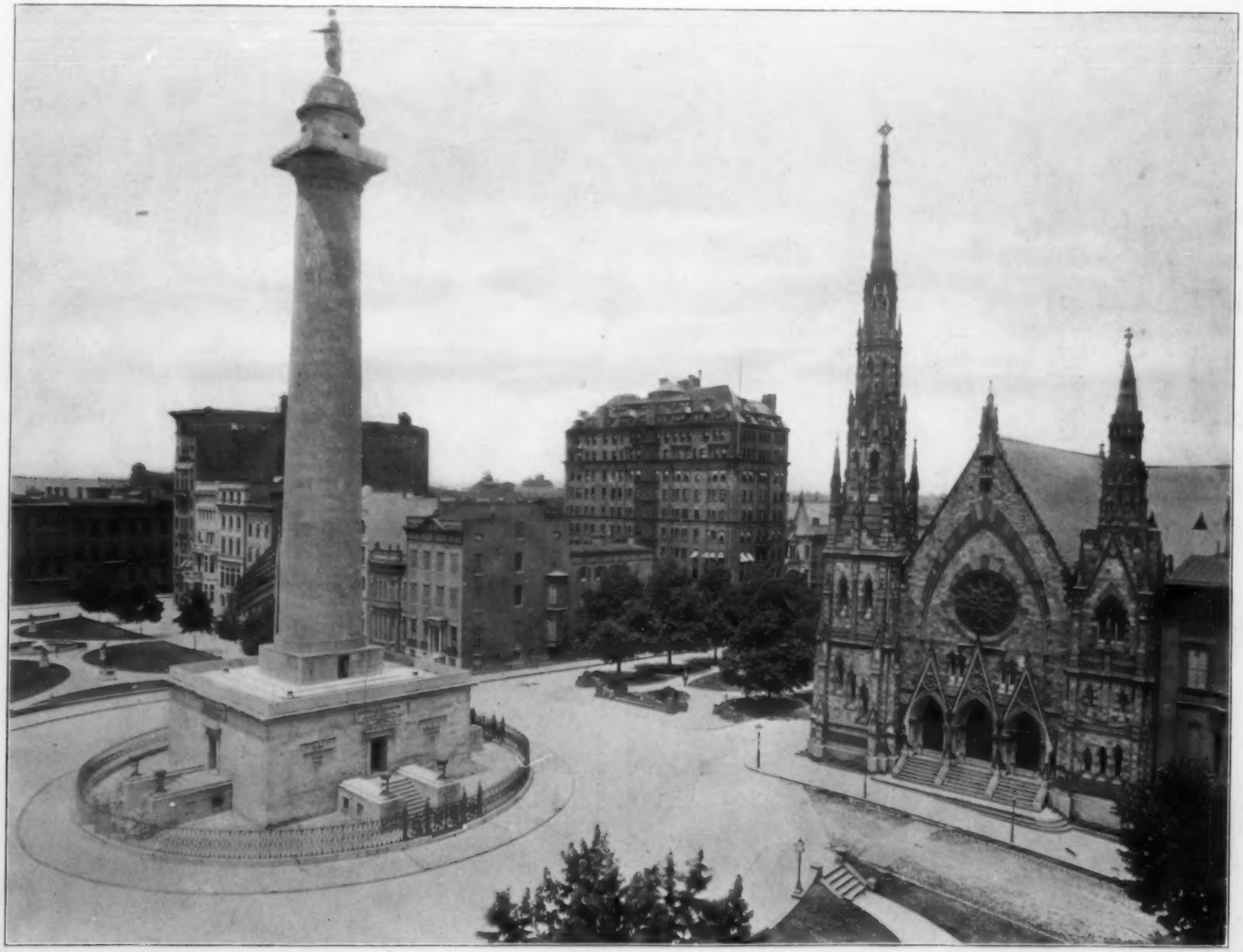

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THE BRICKBVILDER

VOL. 13
Extra Edition to No. 3

DEVOTED · TO · THE · INTERESTS · OF
ARCHITECTVRE · IN · MATERIALS · OF · CLAY

MARCH 1904

THE BRICKBUILDER.

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THE BALTIMORE FIRE: A RECORD OF ACHIEVEMENT.

WE present herewith to our readers a special edition of THE BRICKBUILDER, containing a full account of the Baltimore fire and of its action upon the structural and architectural materials which this journal specially represents, while at the same time the general results of the conflagration upon all classes of buildings are presented in a fairly complete manner. In preparing this number we have enlisted the coöperation of specialists in each line, and our staff was at the city immediately after the fire for a preliminary observation, besides which a second and longer visit was devoted to a more careful investigation of the results after the first excitement had subsided and architects, engineers and contractors had had ample opportunity to collect their ideas, formulate them and feel reasonably sure of their deductions. We have endeavored to present the facts in an entirely unbiased manner and to look at the lessons of this fire from an architectural standpoint, so gathering the array of documents that this special issue of THE BRICKBUILDER shall be a complete epitome of this most unusual test of building materials.

In the course of our investigations we have been enabled to confer at first hand with those who watched the fire from its sudden beginning until its wearily drawn out close, and have collated the opinions of fire chiefs, city engineers, the police and military authorities, as well as of the architects, engineers and builders who have been on the spot and have given it such close attention. THE BRICKBUILDER feels itself deeply indebted for many courtesies received at the hands of the Baltimore officials and others who have, with characteristic southern hospitality, aided the representatives of this journal in every possible way to get at the exact facts in every direction. We wish particularly to acknowledge the courtesies of Colonel J. Frank Supplee of the United States Fidelity and Guaranty Company, his Honor Mayor McLane, Captain Joseph W. Shirley of the Topographical Department, ex-Fire Marshal McAfee, who was in charge of the fire brigade during most of the conflagration, Mr. Joseph Evans Sperry, Mr. Douglas H. Thomas, Jr., Messrs. Wyatt & Nölting and of many other public-spirited Baltimoreans who gave us freely of their time and made it possible for us to collect the detailed information herein printed.

FACTS WHICH THE FIRE ESTABLISHED.

THE most characteristic feature of the material development marking the close of the nineteenth century was the application of the steel frame construction to the necessities of modern business. The tall office building is essentially an outcome of the needs of the times, and with the steel frame has necessarily arisen the parallel development of the burnt clay products. When one considers how really little these products were actually tested before their use, and how academic and in a way inconclusive were all deductions from which architects and engineers could draw their lessons, it is readily seen that the fireproofing methods have been almost self-evolved and that, by reasoning only from probabilities, we devised the systems for safeguarding the enormous structures which our architects have been called upon to erect. The Baltimore fire is really the first instance in which not one, or two, but a number of scientific, logically constructed buildings have been carefully, completely and exhaustively tested. The record which this number presents shows beyond question the extent to which our academic reasonings, our accumulations of processes have been based upon correct principles. THE BRICKBUILDER has ever striven

to present and advocate the burnt clay products from an impartial, reasonable standpoint. These materials have been used under the greatest variety of circumstances. The best of architects and constructors have applied them thoughtfully, intelligently, and with the utmost success. And again, elsewhere they have been used indifferently, carelessly and illogically, with inevitable resulting dissatisfaction. We have never claimed perfection for the special materials for which we stand, but it is not too much to maintain that every possibility which THE BRICKBUILDER has presented in favor of the burnt clay products has been unreservedly substantiated by the record of the Baltimore fire.

If there is one lesson which stands out more prominently than all others, which is shown in every picture and which our readers will find echoed by nearly every special contributor to this number, it is, first, that the material, terra-cotta, when rightly used is the most perfect building material we to-day possess; and, second, that there is considerable room for improvement in methods. We can well afford to acknowledge every case in which terra-cotta has suffered. The lines are right, the direction of growth has been always consistent and persistent, the material itself gives us all the scope we want, but the immediate result of this terrible test of the materials ought to be a more intelligent use thereof, and a more scientific application.

It must not be expected, however, that this fire is to immediately produce many radical changes. There is nothing in the record of the fire which warrants such change, nor is intelligent development to be attained by moving too quickly. The principles involved in the use of terra-cotta are correct. That is beyond question. The material itself is all that could be expected. It is in the minor features that we must look for improvement, and particularly in the setting of the blocks and in that attention to details which are so wearisome and which are yet so important. In the haste and drive inevitable to the practice of architecture in these days, so much is included that it is hard to always appreciate the necessity for the utmost care, especially as involved in parts of a structure which are absolutely concealed from view. And yet it is the hidden column casing, the concealed wall construction, the soffits which are covered with plaster, that constitute the danger spots in a steel frame structure and which demand the greatest care. Terra-cotta has absolutely protected the frame. It has been injured surprisingly little itself, and with relatively trifling exceptions even in the most exposed circumstances the damage is slight; but when the next conflagration comes, as come it undoubtedly will, and when the history of the next great fire is written in these pages, we look to see not merely that terra-cotta has stood the best of all materials exposed, but that fire has made practically no impression upon it whatever. It is logical to expect this. The Baltimore fire shows abundantly that it can be looked for, and if our architects and constructors demand and are willing to pay for thorough terra-cotta construction, the resulting protection can be made absolute.

We feel that much of the assumed rivalry between stone and architectural terra-cotta has been due to a feeling that terra-cotta is a cheap substitute for other materials. It is really nothing of the sort. There should be no rivalry between architectural terra-cotta and stone. The former is the only material which is in every respect suitable to the modern commercial work if we are to expect absolute fire resistance; and if incidentally the material is any less in price, it is simply another advantage and not the main reason for its choice. And a similar comparison can be made between terra-cotta floor construction and its rivals.

So that in conclusion our summary of the Baltimore fire may be presented as follows: Architectural terra-cotta received the most severe tests and suffered the least of any material involved, its total damage being but a slight percentage of the entire cost of the building, while a considerable proportion of such damage can be traceable to methods which, had they been pointed out before the fire occurred, would undoubtedly have been condemned as involving a certain risk. The fire is sure to increase the use of the material, as it has been shown to be the only one which will stand against a conflagration.

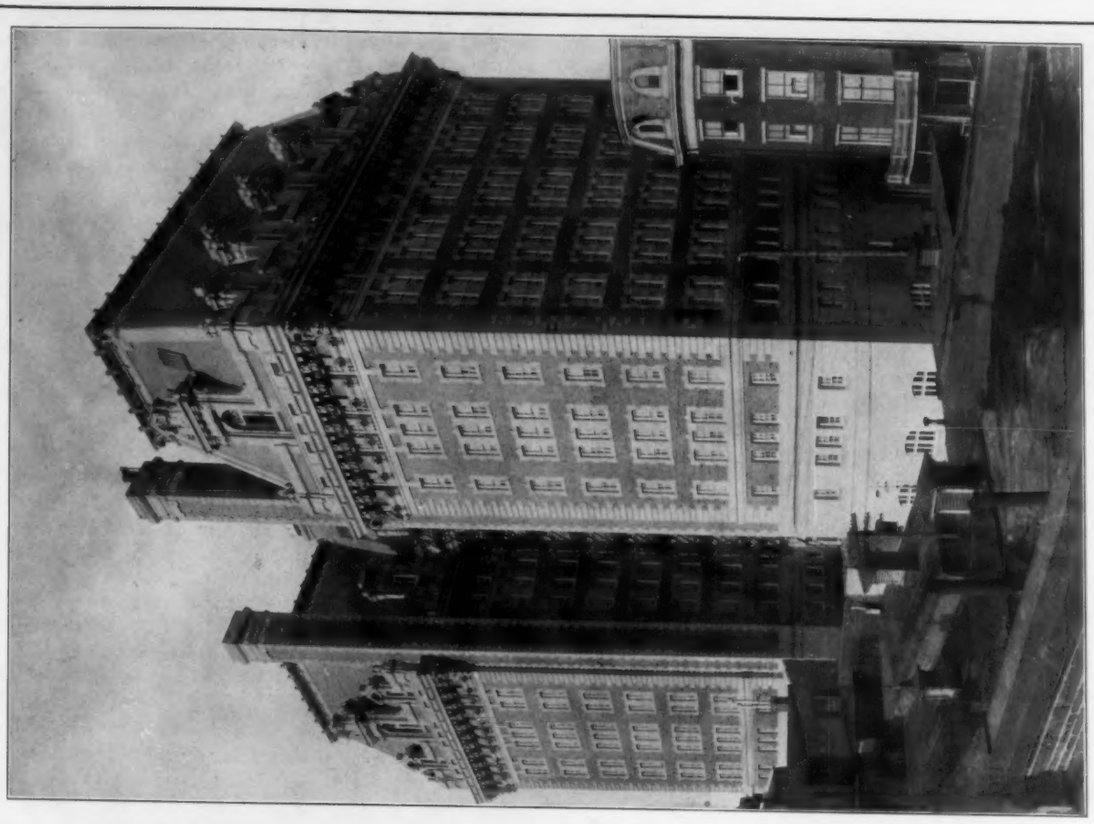
Structural terra-cotta served all of its functions of protecting the frame, and was not affected disadvantageously by the fire at any point. The few failures which occurred in floor arches, as notably in the Equitable Building, can be traced directly to faulty use of both steel and terra-cotta. Elsewhere none of the arches are structurally weakened and in a surprisingly few instances were any of the flanges destroyed. The terra-cotta partitions were not built in a logical manner. They offer a striking instance of a good material wrongly used, and the failures are so apparent that it ought not to be difficult to reconstruct these partitions with terra-cotta so as to be impregnable. Regarding the exterior or architectural terra-cotta, 'tis our firm belief that had it failed to properly protect the steel members next the outer walls, or had these buildings been faced with stone, this disaster would have furnished far different results with which to reckon. To state the case in a single sentence, the Baltimore fire demonstrates that terra-cotta, both architectural and structural, when rightly used will stand the fiercest attacks of fire, and that even when wrongly or carelessly used it is able to protect the frame and will not be structurally destroyed.

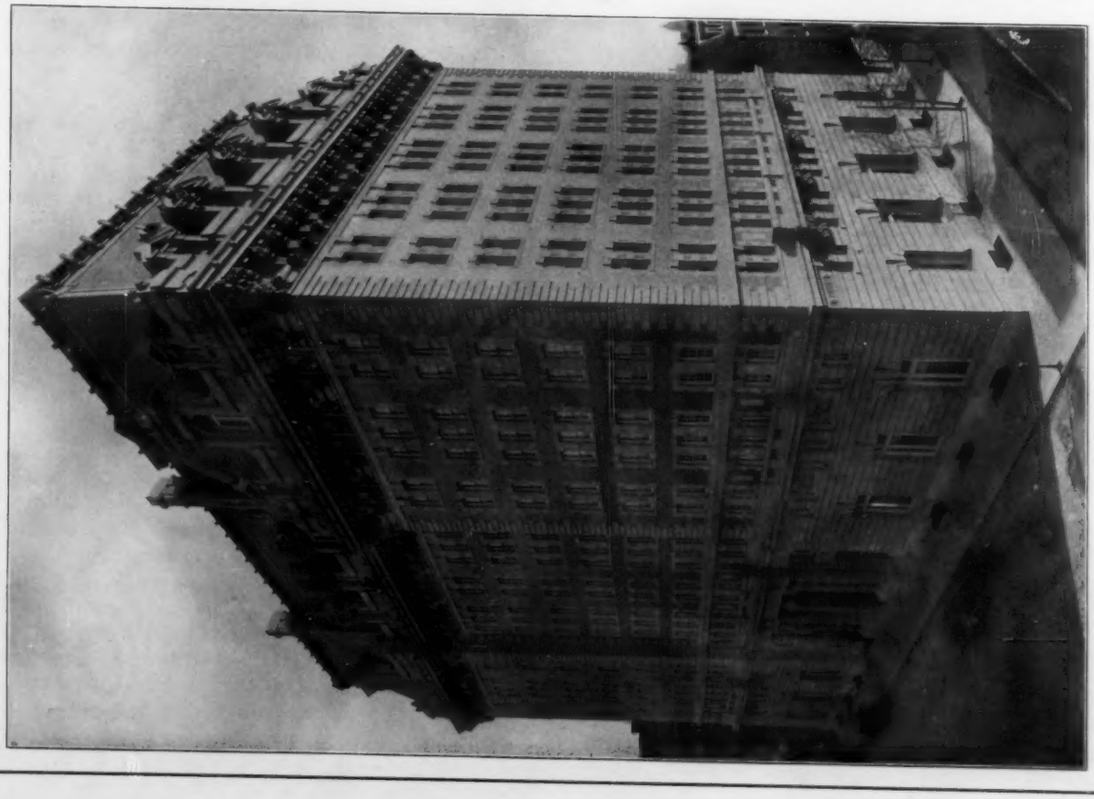
THE OTHER ILLUSTRATIONS.

WE present to our readers in this issue a number of interesting illustrations of Baltimore besides those which specially illustrate the structures which so bravely withstood the attacks of the fire. We cannot leave a city so full of fine architecture, a city known throughout the country for its beauty and for the many examples of excellent architecture which have there been created, without doing more than showing only the scarred relics of the great fight, and we have accordingly gone outside of the fire limits and have collected photographs of some of the interesting Baltimore architecture, which we believe will be of value and profit to our readers.

THE FIRE AS AN OBJECT LESSON.

WHEN a great conflagration such as occurred in Baltimore on February 8 attacks a modern city, sweeping everything in its path, leaving only the walls and the framework of even the best constructed buildings, our first feeling is that it is an exceptional calamity which is so out of the ordinary run that in making provision against fire such extreme cases need not necessarily be seriously considered. As a matter of fact, however, within the present generation there have been five disastrous conflagrations in large cities. The Chicago fire came too soon to be of immediate practical value to the country in an architectural sense, though it was a great object lesson which resulted in the development of terra-cotta as a fireproofing material. The Portland fire left





HOTEL BELVEDERE. Parker & Thomas, Architects.

UNIV. OF MICH.

no record of improvement behind it. The Boston fire, though terribly destructive in a money sense, did not materially affect either the city or the development of architecture as a whole. The Paterson fire offered a good many lessons, by some of which we have greatly profited; but the Baltimore fire is really the first which presents itself in such manner and in which the problems are of such a nature that it can be made of great value to the architectural profession and the building industries. We have here a most severe test of modern methods. In one respect only, by the addition of possible water damage, could the test have been any more severe, and the fire has aroused an interest far beyond that of any other conflagration in the world's history. And it is safe, moreover, to predict that very important structural and architectural improvements will very shortly manifest themselves as a direct result thereof. The fire has been studied as never fire was studied before. For a fortnight after, the Baltimore hotels were crowded with engineers, constructors, architects and insurance representatives, who had come from all parts of the country to see to what extent our most improved methods of construction could endure the attack of a conflagration. And with so many keen minds eagerly scanning the bulwarks which so stoutly endured, it is not likely that any lesson will be lost.

In judging of the results of the fire, one must bear in mind that a conflagration of this sort cannot be compared to a huge roaring blast furnace. The ruins show all manner of strange freaks. The fire in some places would be so hot as to melt cast-iron radiators, while in perhaps the same room a thermometer would hardly be damaged. And so in one street we would have on the one hand a fireproof structure stripped bare of all finish and contents, while right across the way may be a simple building of ordinary construction on which the paint is hardly scorched. Consequently, if any one attempts to study this fire with a bias he can prove anything he wishes. Any material can be claimed to be absolutely the best or any other absolutely the worst, unless the materials and the construction are measured under exactly similar conditions. Then it is, we believe, that the unquestioned superiority of the burnt clay products is manifested beyond question.

BALTIMORE'S OPPORTUNITY.

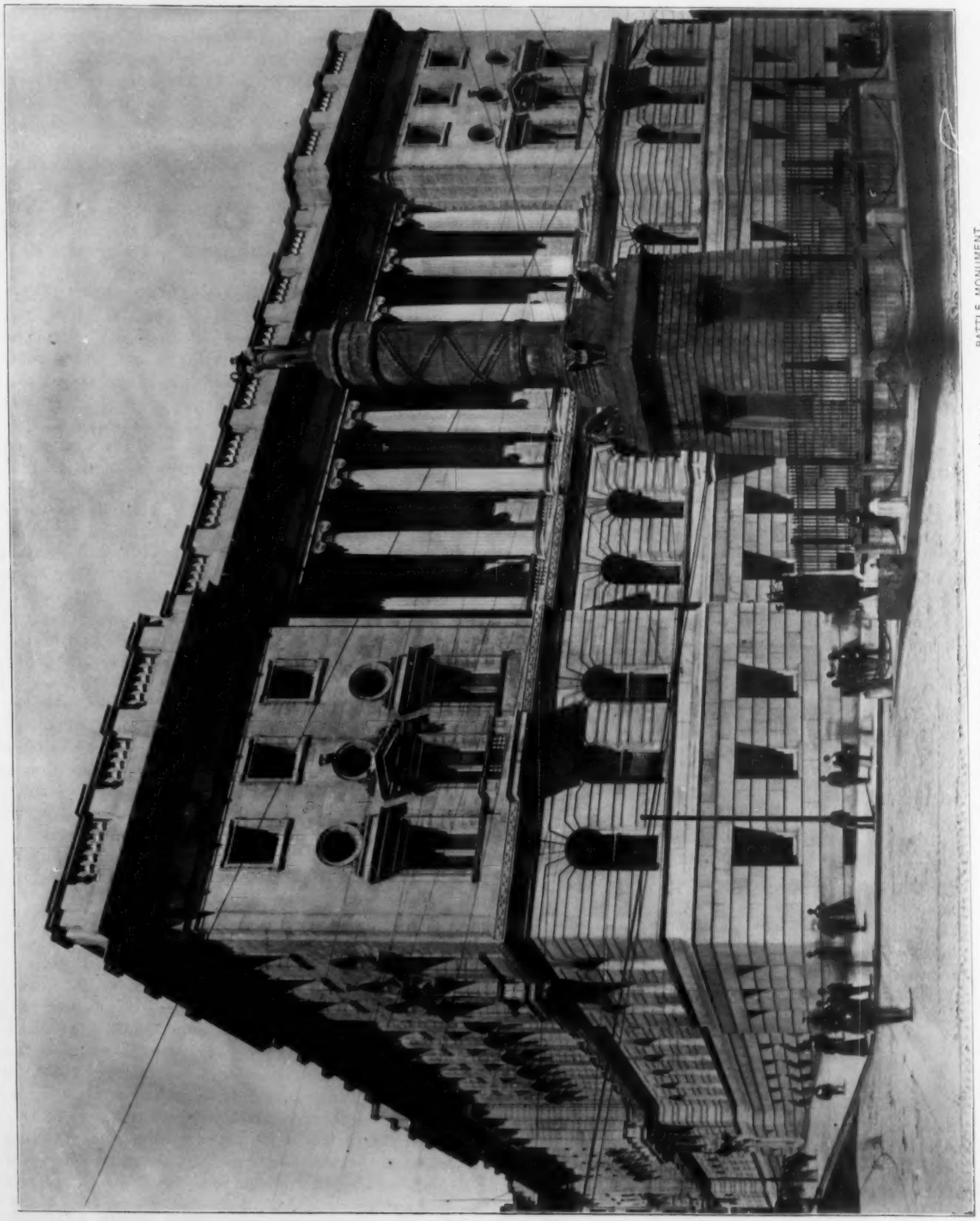
THE city of Baltimore has a great opportunity before it. With all but a dozen buildings of its business center flat on the ground, it becomes a relatively simple matter to make straight the crooked places, to enlarge the narrow streets and to do away in a measure with some of the troublesome grades which are such a feature of Baltimore streets. There is an opportunity for a beautiful commercial city to arise from the ruins of this great fire, and it can certainly be said that the city authorities so far have not been blind to their opportunities. Nothing is being done in a hurry. Time is taken for deliberation, and even the merchants who have found themselves houseless are disposed to think pretty carefully before committing themselves or the city to unwise lines of rebuilding. A legal decision has put it that the city authorities cannot refuse a permit to build if such permit is in accordance with the terms of the law, but all the permits so far issued have been coupled with a reservation that in accepting the permit the property owner agrees to hold the city harmless for any damages by reason of any change in street lines or grades, and to promptly change any building erected to conform to new street lines or grades. Such a proviso practically renders the permit of so little value that up to the present time few builders have begun operations. And it is pretty safe to say that when the lines are finally laid down, unless political influence intervenes, the new city may easily be all that its most ardent admirers would ask for it.

FALSE IDEAS OF THE FIRE.

THE descriptions which have appeared in the daily papers of the manner in which Baltimore buildings of first-class construction have withstood the action of fire have illustrated a very peculiar phase of the human mind, namely, the inability to clearly distinguish between the imaginative and the real. Even so cautious a paper as *Harper's Weekly* permitted itself to refer editorially to the manner in which "the tallest and best constructed of the Baltimore buildings melted away before the flames like wax." A builder, who has certainly had sufficient experience to let his reason tell him better, gravely asserted to us that he stood on one of the Baltimore streets and watched the approach of the flames to one of the tall office buildings, saw it catch on fire in several places, be rapidly consumed and sink away in nothingness like a pile of kindling, every wall flat on the ground. As a matter of fact, the amount of actual *structural* damage to all of the Baltimore buildings of first-class construction would be covered by a few thousand dollars, representing a small per cent of the value of the edifices themselves. But notwithstanding this the newspapers have continued to report that fireproof buildings did not stand the fire, and that actual observation showed they had failed before the fury of the fiery blast. And we have no doubt such writers really thought they saw what they described. If any one stands at the base of a tall chimney or looks up at the height of a shaft like Washington Monument, it is very hard to persuade him that the whole structure is not moving over bodily at the top, and is about to fall and crush him. If, on a clear day, such impressions are given by a perfectly stable structure, it is very easily seen how, in the excitement of a great fire, with everybody tense with alarm and with buildings on fire at every hand, the six or eight isolated buildings of first-class construction might not only be merely confounded with the cheaper constructions which did go down like wax, but might even themselves at times appear to be on the verge of dissolution.

METAL WALL TIES.

ONE feature which showed conspicuous failure in the Baltimore fire was the metal wall ties. On several of the buildings the exterior brickwork was bonded to the backing only by the regular wire metal ties, and the result in nearly every case was disastrous. On the rear of the Continental Trust Building over large areas of the wall the face brickwork was entirely gone, and in no case was the mere metal tie found to be of sufficient reliance for holding the face brickwork in place. The use of such ties ought to be prohibited. In some cities the laws distinctly provide that the brick facing shall be bonded to the body of the wall by brick header courses, as in no other way can a homogeneous and satisfactory construction be secured.



THE NEW COURTHOUSE. Wyatt & Nolting, Architects. BATTLE MONUMENT.

UNIV. OF MICH.

The Story of the Fire.

AT 10.50 A. M., Sunday, February 7, the first alarm of the great Baltimore fire was received by automatic box 854, located in the warehouse of J. E. Hurst & Company at the southeast corner of Liberty and German streets. This was a large department store of ordinary second-class construction, some six stories high and open on three sides towards the street and with windows on the fourth side. The building was practically undivided in each story and was packed from cellar to roof with goods of a highly inflammable nature. The fire department was upon the ground very promptly and ran a chemical and a two and one-half inch hose through the doorway into the basement, where the fire was found among the packing boxes near the elevator shaft, towards which the flames were drawing.

At 10.51 a second alarm was sent in and a few moments after a general alarm calling out the entire department was sounded. The fire in the Hurst Building apparently communicated to goods which speedily filled the building with a dense body of smoke, and in seven minutes after the receipt of the first alarm by the automatic an explosion of the smoke took place which lifted the roof, tore out all the glass in the building and burst into flames which enveloped the entire structure and pierced the buildings on the opposite sides of Sharp, German and Liberty streets.

A municipal ordinance of Baltimore prohibits the storing of explosives in buildings, but allows the same to be kept in suitable receptacles on the sidewalk. According to the statement of one who witnessed the beginning of the fire, gunpowder was stored in a case on the sidewalk opposite the Hurst Building. This was ignited by the flames, resulting in a second explosion, which not only materially hampered the efforts of the fire department, but smashed in adjoining windows and allowed the fire to spread; so that in fifteen minutes after the first alarm the buildings on the northeast and northwest corners of Liberty and German streets and the northwest, northeast and southeast corners of Sharp and German streets were on fire. The heat spread so quickly that two of the fire engines were set on fire and could not be rescued. The Hurst Building had not been burning ten minutes before the roof and parts of the walls fell in. The atmospheric conditions were peculiarly favorable to the spread of fire. There had been quite a drenching rain the day before, but this seems to have had no effect in retarding the conflagration. A high wind accompanied by low temperature was prevailing at the time. The wind was cyclonic in nature, and at the beginning of the fire was blowing from the southwest. The flames spread from building to building, baffling all the attempts of the firemen to even get their apparatus in position quickly enough to make any effectual stand. Within half an hour the authorities had telegraphed to Philadelphia, Washington and New York for help, which was being rapidly pushed towards the doomed city.

The Hurst Building was about in the center of the retail district, and the fire swept from it in a northeasterly direction towards the group of buildings which included the magnificent Courthouse, the Post Office and the City Hall. As will be seen by the map accompanying this issue there existed what might be termed a chain of modern first-class constructed office buildings, including the Union Trust, the Herald, Calvert, Equitable, Baltimore and Ohio, Continental Trust and Maryland Trust. These structures, roughly speaking, were stretched as a barrier directly across the path of the flame. The Union Trust received the attack first and was the most seriously damaged of any. By the time the flames had reached the Herald Building the authorities seem to have been considerably demoralized. This structure was thoroughly well built, of approved fireproof construction, and undoubtedly in a measure protected the Courthouse immediately across the street from it, but the authorities attempted, very unwisely it seems, to blow up the building, with the thought that a ruined structure would be more of a check to the spread of fire than a structure in which neither the walls nor the floors were likely to be totally destroyed. Dynamite had been previously used to demolish a building at the corner of Charles and Fayette streets, the only results of the explosive charges being to shatter all the glass in the Union Trust Building windows directly opposite, and to materially aid in the spread of the fire. Three times were dynamite charges exploded about the Herald Building, but they entirely failed to accomplish any result whatever. About this time, however, the wind in its course had shifted slightly, so that the full brunt of the blast of the fire was no longer directed toward the Courthouse, but played with full force against the westerly front of the Calvert Building, completely gutting the structure from top to bottom in less than an hour, passing straight through it from side to side, and cleaning out the entire contents of the immediately adjoining Equitable Building. By this time the fire extended in a rough semicircle, starting from the Hurst Building and reaching around to the Equitable, and with the shifting of the wind so as to blow finally towards the east and later towards the southeast, it seems as if the circle of fire was drawn bodily across the whole of the heart of the business section of the city. Then it was that the Continental Building received its fiercest attack. From this structure to the line of the upper edge of the fire, which was still blazing fiercely, was a distance of nearly half a mile, which had been covered entirely by buildings either very low or of nothing but the ordinary construction. These structures went down like cards and left nothing but a vast mass of flame, which beat with inconceivable fury against the entire west front of the Continental Building. From there the fire jumped on, performing some curious freaks, sparing a few structures which one would not have expected to resist, and gutting in a few minutes other buildings which were constructed with the utmost care.

The fire raged almost without check until it reached the narrowing triangle towards the southeast, where the arm of the harbor and a narrow creek known as Jones's Falls come together. Here were located the large power house of the Electric Street Railway, the Union Dock, the Merchants' and Miners' Transportation Company's pier and a quantity of smaller and more inflammable structures. Here the most determined stand was made against the fire, and it was at this point that the New York firemen who had come down by special train put up a splendid resistance, and undoubtedly kept the conflagration from spreading across Jones's Falls into the densely built residential quarter towards the east. All of the engines which could possibly be spared from the edges of the devastated area were placed along the course of Jones's Falls, each bridge being made a point of vantage. By two A. M. of Monday it was evident that the fire had been stopped at the foot of Union Dock, very largely because of the splendid work which was done by the fire boat "Cataract." The fire, however, leaped across the falls at four

MAP SHOWING THE DISTRICT DESTROYED BY FIRE IN BALTIMORE, FEBRUARY 7, 8, 1904.

places, and at times the fate of East Baltimore trembled in the balance. It was late Monday afternoon before the great fire was conquered, and the city was not really safe until Tuesday, while isolated structures continued to blaze all the week, and as late as the 4th of March, nearly a month after the fire, the ruins in places were still smoking, and in a few isolated cases flames continued to burst from beneath indistinguishable piles of brick.

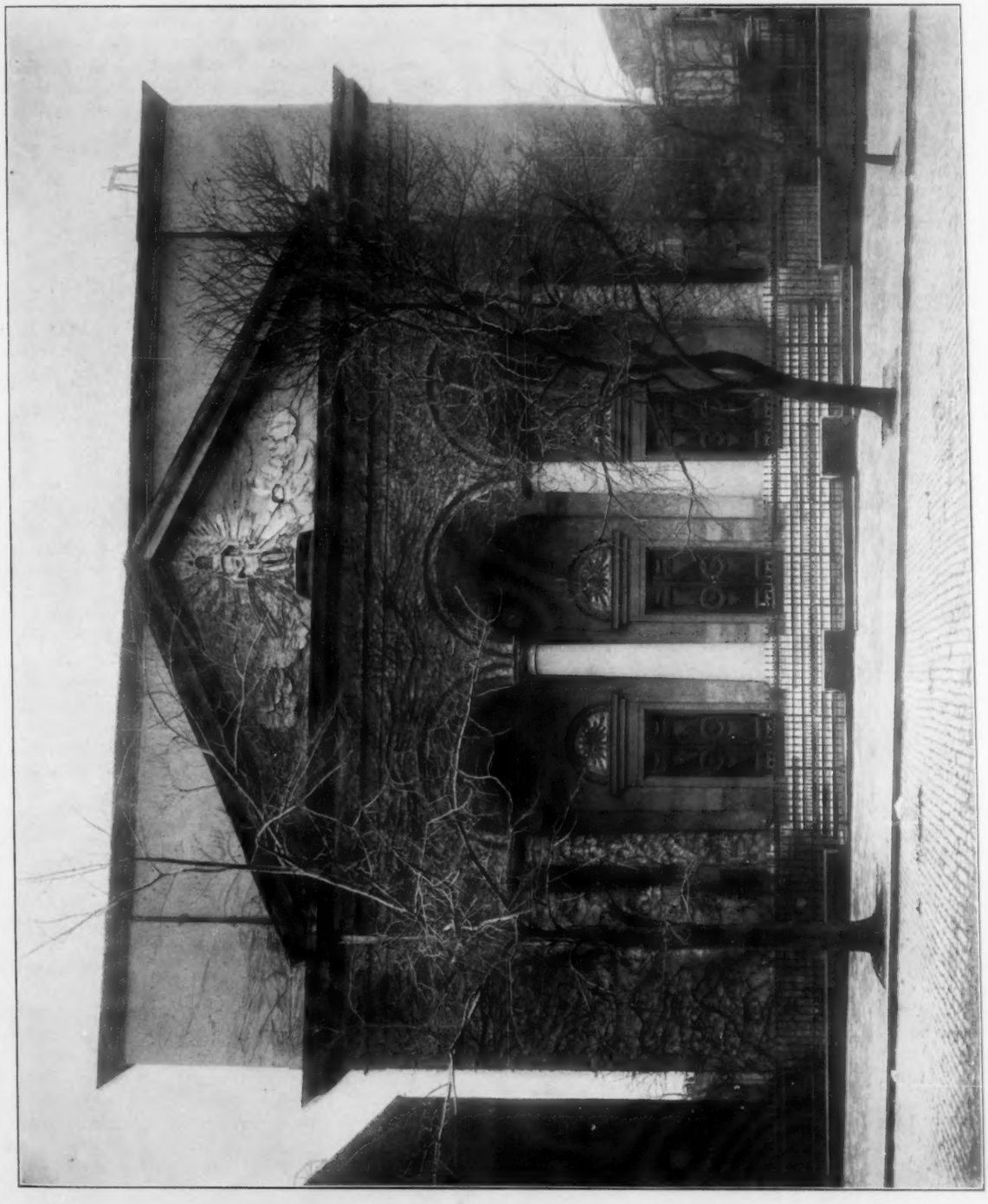
In a space of about twelve hours the fire had done its greatest damage, wiping out the very heart of the retail, financial, wholesale and shipping districts of Baltimore, devastating an area of over 150 acres, destroying more than 2,500 buildings in 70 city blocks and causing a financial loss estimated all the way from $90,000,000 to $150,000,000. Besides this, the indirect loss through interference with commerce has been about a million dollars a day since the fire. And before the fire is forgotten it is estimated that the entry on the debit side of the city ledger will be nearly $200,000,000, or an average loss of over $300 for every man, woman and child in Baltimore. Of the total loss probably not over $35,000,000 or $40,000,000 will be recovered from the insurance companies.

The city was immediately placed under martial law and a strong cordon of soldiers encircled the whole burnt district. Military protection was kept up until the 1st of March. There have been, so far as recorded, no casualties to life as a direct result of the fire. Two deaths were reported as a result of exposure, but these might be traceable to other causes as well. The city of Baltimore certainly managed the fire admirably and has shown itself since perfectly able to give a good account of itself. By Wednesday morning wrecking crews had been organized by the city to clear the streets in the burnt district and demolish the dangerous ruins, and the work of these crews was carried on continuously until about the 10th of March, by which time all of the unsafe walls, chimneys and vaults had been demolished and the streets cleared so that traffic could proceed through them. There is one respect, however, in which the city authorities failed to use good judgment, and that was in the use of dynamite. It would not be strange if a fire of this sort should produce a somewhat hysterical state in the minds of those who should undertake to stop its course, but as far as can be ascertained by comparison of results the use of dynamite was absolutely uncalled for. Not in a single case did it have any effect in checking the spread of fire and in nearly every instance was it a direct aid to the spread of combustible material. The high wind fanned the flames to a degree which is hard to appreciate. Flying embers and even large masses of burning wood were carried high over the tops of ordinary buildings, and the fury of the blast was such that an open space of even 150 feet was quickly jumped by the flames. This was shown in the case of the markets in front of the Street Railway Power Station, a group of one-story structures in a space perhaps 200 feet wide. The flames jumped clear over these and destroyed buildings on the opposite side before the markets were fairly ablaze. The ruined walls of a second-class building would have been a better check to the fire than the same open space filled with the inflammable débris which would result from the blowing up of such a structure with dynamite, and if fire fighters are to take a lesson from this conflagration it would be never to undertake to check the spread of fire by the use of explosives.

This conflagration has been called a rich man's fire, in that at no point did it attack the poorer or the residential quarters. The first direction of the fire was towards the finest residential district. At the close of the fire it was heading directly for the cheaper residential quarter, but so far as is known no one was rendered homeless and the loss is confined exclusively to the business district. The financial center of the city was at German and Calvert streets, directly opposite the Continental Trust and in the heart of the hottest portion of the fire.

SMALL OFFICE BUILDING, 213 COURTLAND STREET.

THE SHOT TOWER FROM THE COURTHOUSE.



OLD UNITARIAN CHURCH, CHARLES AND FRANKLIN STREETS.

UNIV OF MICH

Architectural Terra-Cotta in the Baltimore Fire.

BY C. H. BLACKALL.

IF any one were to investigate the results of the Baltimore fire with the expectation of finding that any building material was impregnable or withstood in perfect condition the utmost assaults of the conflagration, he would surely be disappointed. The endurance of all materials is relative rather than absolute. Under conditions such as prevailed at times and at special places in this fire there is no known material which would be entirely unharmed. It is only when one examines at close range the half dozen fireproofed buildings which were exposed to the conflagration, and especially when one goes into the upper stories and looks out of the scarred window openings or considers the ornamental portions and the extent of their damage, that one realizes fully, first, how terrible was the test to which these buildings were subjected; and, second, how, notwithstanding its failure in places and under some conditions, one material, and only one, can be said to have put up any effective resistance against the fire. This material is terra-cotta. And when one compares the damage which it has suffered with that which has befallen every other building material exposed to the flames, one appreciates how, admitting all its limitations, it has shown itself to be the most nearly perfect fire-resisting medium which we now possess. That it can be improved upon goes without saying; but its weaknesses as developed in this test have been due far more to the manner in which it has been used, to the particular form of construction, than to the composition or quality of the material itself.

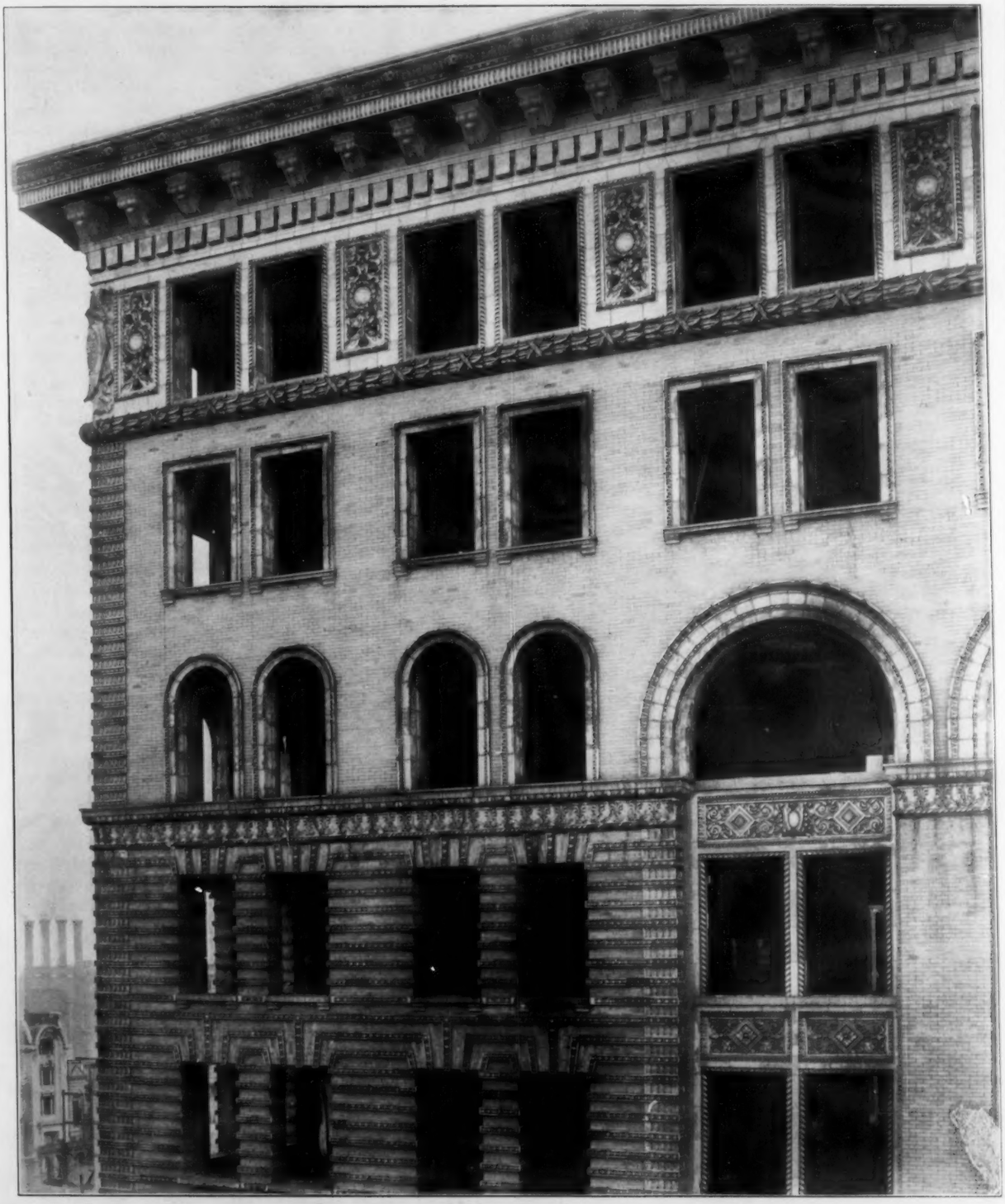
In one respect the fire was inconclusive. It spread so rapidly and the huge buildings were so speedily enveloped in flames that the fire department had little opportunity to play streams upon them, and consequently they have little to tell us of what would be the combined effect of heat and water on architectural terra-cotta. It is extremely doubtful, however, if the result would have been materially different had the constructions been deluged with water. The fire came on a very cold night and was accompanied by a high wind, which gave to the traveling flames the force of a blast furnace, heating the exposed terra-cotta to a sufficient degree in places to fuse the surface. But the greatest damage to the material came apparently after the fire had passed, when the cold air struck upon the heated surfaces, causing much of the shattering and damage we now find. A stream of water could hardly have had any more disastrous effect than the cold air. We must therefore be justified in accepting the actual conditions as representing the utmost to which terra-cotta would ever be exposed, and the degree to which it has successfully endured may be taken as an index of what we have a right to expect from it hereafter.

What damage there is can be classed in one of three categories: first, the direct eating away of the surfaces or of the edges by direct flame; second, the shattering due to the combined effect of excessive heat and low temperature; third, the mechanical damage caused by poor construction or the effect of the expansion of the steel frame.

The damage due to the first condition is surprisingly slight. Some of the architrave moldings in the Union Trust Building and a few of the jambs on the long side of the Maryland Trust Building are almost the only instances found by the writer, after most careful examination, wherein terra-cotta could be said to have been eaten away by the direct action of flame or heat. The damage due to the second condition, of combined heat and cold, is most marked in the court of the Calvert Building and in the upper portion of the north end of the Continental Building. By far the greater portion of all damage is traceable, however, to the third condition. The tendency has been to treat the material too much as a mere mantle and to ignore its self-sustaining qualities. Wherever it is found reënforced by the use of exposed iron, as in the case of mullions or lintels, and the construction is exposed to heat, the expansion of the iron, which is inevitable, constitutes a serious menace to the material. This has been demonstrated beyond a doubt in all the buildings at Baltimore.

An interesting feature in all these buildings is that, with very trifling exceptions, the cornices, which in each case are terra-cotta throughout, were hardly damaged at all, and this notwithstanding the fact that the greatest amount of heat seems to have been directed against the upper portions of the buildings; in fact, we know that as a rule the low buildings in the burned district escaped with trifling injury. We know further that the lower stories of the fireproof office buildings bear marks of a very much less degree of heat than is shown in the upper portions, and yet the cornices are practically intact.

The Union Trust Building, at the corner of Fayette and Charles streets, constructed from the plans of Winslow & Bigelow of Boston, was the first of the tall buildings to be attacked, and suffered the most severely in the fire. The flames reached it early Sunday afternoon, first from the southwest and then from the west. The building directly opposite was occupied by a large toy establishment, which the city authorities, in a frantic attempt to do something, tried to destroy by the use of dynamite, succeeding, however, only in wrecking all of the glass in the Union Trust Building and effectually spreading the fire instead of stopping it. This building was constructed with the lower three stories of stone with brick walls and terra-cotta finish above, and a wide projecting terra-cotta cornice over the whole. Many of the windows above the first story had cast-iron mullions, and in nearly every case these mullions, expanding by the heat, were forced up into lintels and down into the sills, breaking the terra-cotta, though the spandrel panels were apparently uninjured. In the three upper stories the mullions were of terra-cotta backed by steel, and all but five of these mullions are ruined. The surface of the terra-cotta work around the windows was gone in many places, so as to show even the cross partitions of the terra-cotta backing, and the brickwork immediately adjoining is damaged quite severely, showing how excessive must have been the cutting action of the heated blast. The windows on each side of the central portion of the long front had brick jambs. In every one was found a crack running the whole height of the window opening, and about four inches away from the jamb, showing apparently that the ironwork within had been heated enough to push out the brick. Of the entire cornice only three brackets were broken, and these only in part. The band course below the line of the ninth-story windows was broken slightly in four places. Aside from the damage caused by the expansion of the ironwork, only about seven and a half per cent of the terra-cotta was injured, and nearly all of this injury was on the jambs. This building is to be rebuilt from plans of



DETAIL, THE EQUITABLE BUILDING.

UNIV. OF MICH.

Parker & Thomas, and carried several stories higher, and all of the facing, including both terra-cotta and stone, has been entirely removed, leaving nothing in place but the brick backing and the casing of the structural steel.

The Herald Building was designed by Joseph Evans Sperry. It was attacked on two sides. It undoubtedly formed a buffer between the fire and the Courthouse, and the exterior is in a very fair condition to-day, requiring but little work to make it as good as new. The two lower stories are of stone, the upper stories of brick and terra-cotta. There are no iron mullions anywhere, and apparently not a single terra-cotta lintel on either front is at all damaged, and there was found only one jamb where the terra-cotta was slightly abraded. The cornice seems to be intact, all the elaborate frieze appears unbroken, and there is not one per cent of the architectural terra-cotta which will need to be replaced.

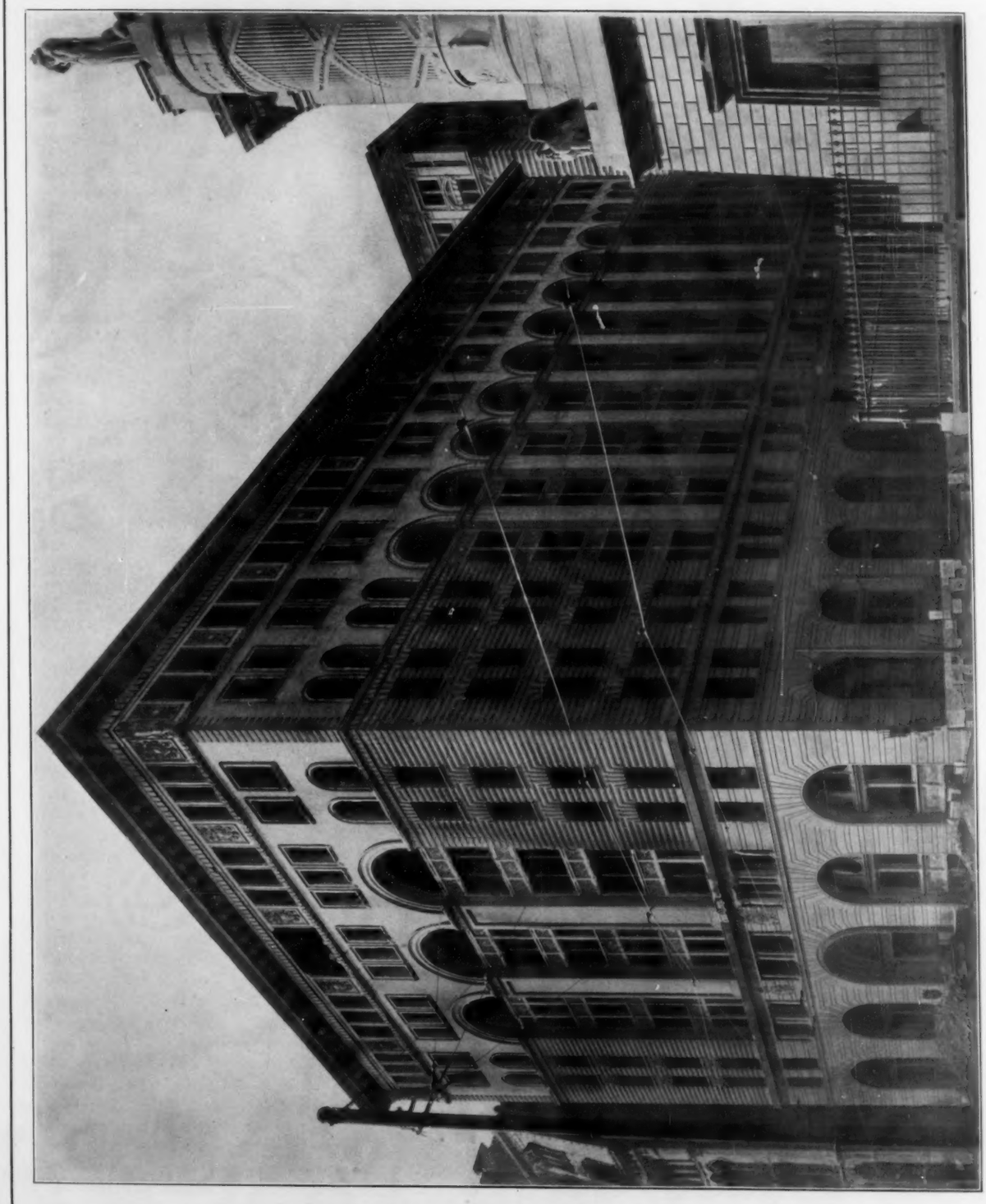
The Calvert Building was also designed by Mr. Sperry. It is a twelve-story steel frame structure, faced with stone in the two lower stories and with brick and terra-cotta above. The fire entered from the west, and on this front the damage is so slight that one would not notice it had ever been through the fire at all. The closest inspection cannot show as high as two per cent damage to the terra-cotta. Throughout this building iron mullions were used, and in a few instances they seem to have acted as the mullions in the Union Trust Building by pushing up and down and wrecking the terra-cotta, but these mullions were not constructive and there was not a great deal of this sort of damage. The west portion of the Fayette Street front shows the effect of great heat. The brick have suffered quite as much as the terra-cotta. Some of the lintels in the eleventh story of the right wing are sufficiently damaged to require being replaced, and quite a quantity of the plain band work in terra-cotta, which is bedded in the solid brick wall, is destroyed on the surface. The cornice is considerably blackened by the heat, but does not appear to be injured. The left portion of the front is hardly injured at all. The greatest damage occurred in the courtyard. The flames sweeping through the building emerged into this court, transforming it into a huge blast furnace, and in some places the terra-cotta was actually fused upon the surface. Very little of the cornice is injured, however, but nearly all of the architectural treatment of the upper two stories is damaged beyond repair, and there are a number of breaks in many of the windows on both sides of the court. In a rough way probably about fifteen per cent of the terra-cotta in this building as a whole is ruined, but the bulk of this damage occurred in the court.

The condition of the Equitable Building, immediately adjoining the Calvert, is a good deal of a surprise. On the side towards the Calvert Building, whence the fire came, while the granite sills and some of the brickwork are damaged, the terra-cotta shows hardly any signs of mechanical injury. The modeling is sharp and clear, there do not appear to be any cracks and no evidence of anything approaching disintegration or melting. Likewise on the long Fayette Street front the terra-cotta has the appearance of being uninjured, except by smoke. It is only on the Calvert Street front, opposite the long end of the building, that the damage is noticeable, where the flames burst out from the windows with all the added fury of the combustible contents and the floor material of the building itself, and in the seventh, eighth and ninth stories several of the mullions and a few of the jambs are badly damaged, but even here the damage to the architectural terra-cotta could be repaired at a comparatively slight cost.

In the Maryland Trust Building, designed by Baldwin & Pennington, the terra-cotta on the narrow front was very little exposed, but on the long front it had a double attack. The fire from within was very fierce, and the buildings directly opposite were of a nature to generate an intense heat, so that between the two the jambs of the windows in most of the stories have suffered badly and will probably all be replaced. The highly ornamental spandrel panel work, however, which is full of delicate detail, seems upon inspection to be almost entirely uninjured, the cornice shows no signs of damage, and in a rough way twenty-five per cent would be the extreme of damage to the architectural terra-cotta.

The Continental Trust Building is a sixteen-story structure, designed by D. H. Burnham & Co. In some respects it was the most severely tested of all. It was directly in the path of the hottest portion of the fire, and it seems to have been caught in an eddy, so that when the flame struck it the fire did not catch in one story and spread from floor to floor, but each story ignited spontaneously under the tremendous blast, and the fire rushed through from side to side of the building with hardly any hindrance. There has been a great deal of controversy about the condition of this building. Immediately after the fire various statements were made, that the framework was twisted, that the exterior facing would all have to come off and was injured beyond repair, and that the building would be a total loss. The writer made a most careful examination of the architectural terra-cotta and was not content with observing merely the surface, but with the aid of a coupling pin which was found in one of the rooms vigorously attacked any cracked or checked blocks in an endeavor to find out to just what extent the terra-cotta was injured. Every story was taken in turn and a most thorough investigation made of the whole. On the long west front there is no sign of a single break of any description in the cornice or the frieze. A few of the mullions are split in places by the heat and will have to be replaced ; but in every case the terra-cotta seems to have broken because of the alternate heating and cooling effect, and there is no visible deterioration of the quality or any evidence of it having yielded to fire as such. On the narrow front towards the north the columns in the upper stories are so badly wrecked that they cannot be repaired ; also in several of the lower stories the mullions are ruined, but even on this front the cornice is uninjured. The total damage to the architectural terra-cotta is surprisingly small. Pieces which have been broken off give a good clear ring when struck with a hammer, and even the most severely damaged columns of the north front show not a trace of any disintegration in the material itself. Nor do the surfaces show any fire checking due to the conflagration, nor any cracks into which frost or water might work. Surely hardly anything more could be expected of any material.

On South Street, between Baltimore and German streets, is or was all that is left of the building of the Maryland Life Insurance Company, showing a five or six story front, with stone in first story and brick and very finely designed terra-cotta above. The interior of the building is a complete wreck, even the party wall is down, the stone is badly injured, but the terra-cotta is apparently in perfect condition, without a break. The front wall is all that is standing, and the terra-cotta could be used in a new building without a dollar of loss beyond the cost of handling.



THE EQUITABLE BUILDING. Carson & Sperry, Architects.

UNIV. OF MICH.

Fireproof Buildings Tested.

REPORT BY OUR STAFF ENGINEER.

THE winter of 1903–04 will certainly become historic in the annals of fireproofing.

First, in Chicago, the Iroquois disaster, in which nearly six hundred lives were sacrificed within a single building, and now, in Baltimore, a far-reaching conflagration, in which one hundred and forty acres are devastated, but without the loss of a single life.

If such visitations of death to humanity and destruction to property are not sufficient warnings to awaken the seeming public apathy regarding fireproof construction, then a miraculous writing of fire on the wall would not accomplish more.

COURT OF THE CONTINENTAL TRUST BUILDING.

The Iroquois Theater horror has already done much to awaken the public conscience in regard to the measures which are necessary for safety in all of our places of public amusement or assemblage, and at least a temporary stimulus has been felt in the enforcement or in the improvement of municipal regulations. This is true not only of theaters in large cities, but fortunately the effect is being felt in towns and even villages, in schoolhouses and town halls. The lesson here was plain — every known or reasonable precaution must be taken to assure the safety of human life. If the laws are sufficient, they must be enforced; if insufficient, they must be revised.

The Baltimore conflagration teaches a different lesson. Here the question of safety to human life has not been much in evidence, although if the fire had occurred on any other day of the week than when it did the result might have been far different. The merchants and bankers of Baltimore are much more concerned at the present time with the destruction of property.

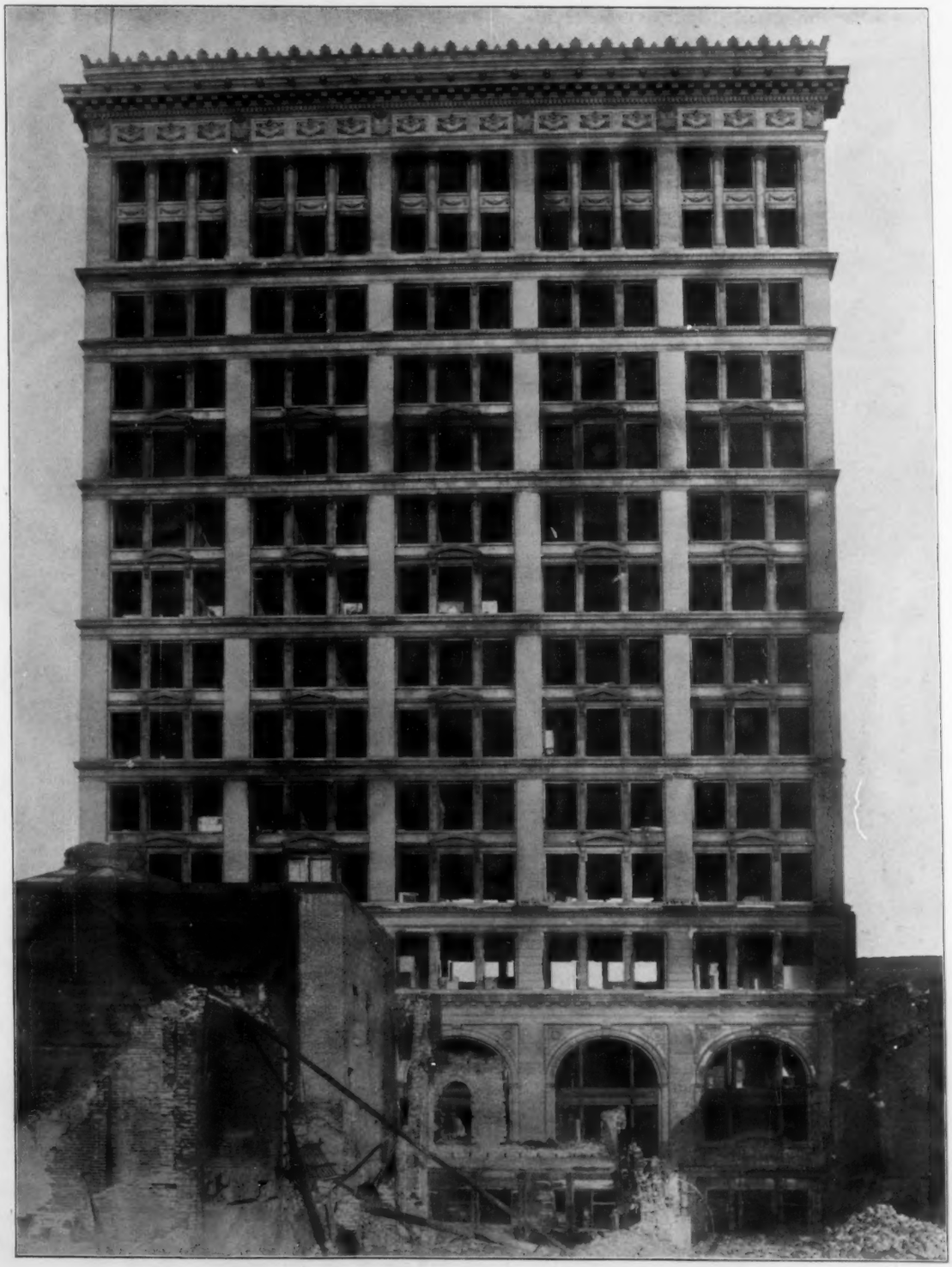
From the early accounts which were sent out describing the far-sweeping results of this fire, the faith of those who had heretofore trusted in the efficiency of fire-resisting construction was rudely shaken. Alarming reports as to the utter collapse of steel buildings, and the immediate necessity for dynamiting the ruins of others which were declared to be in a dangerous condition, struck wonder to the hearts of those who had looked for better things; and when the writer visited Baltimore a few days after the cessation of the conflagration, the first general impression was certainly not reassuring. The acres upon acres of smoldering ruin and the utter desolation of the fire-swept area were overpowering. Here were one hundred and forty acres, in the very heart of Baltimore's most prosperous commercial quarter, laid in ashes, with tottering brick walls, warped and twisted iron and steel work, fragments of granite or marble, and here and there a burst of flame still showing forth.

But as one became more accustomed to the magnitude of the disaster, a vague impression of which may be conveyed by the illustrations given, the realization became more and more apparent that all this wreck and ruin on every hand were but the ever-to-be-expected result from non-fireproof "mill-building," or "slow-burning" construction under such a test as this. These structures, generally leveled to the ground, constituted no test of fire-resisting methods; and if they had been classed as "fireproof" by those writing of the disaster, no wonder faith was shaken and fears awakened.

Turning, then, for some structures worthy of interest from a fire-resisting standpoint, the attention is quickly awakened by the sight of several buildings on the extreme northern boundary of the fire area, — towering structures, almost in the heart of the burned district. At first view these appeared to have escaped the almost universal devastation. A closer examination, however, shows that these structures, too, have suffered the terrible baptism of fire, and then it is that one realizes that here is the test, not simply of one fire-resisting building, greater in extent and importance than those heretofore memorable fires in the Home Insurance Building, the Horne buildings and others of similar character, but the test of *many* fireproof buildings, some side by side and even connected, others isolated amid ruin on all sides. Instead of wrecked or collapsed frameworks, these buildings are found to be not only standing but structurally sound.

The contrast between non-fireproof construction or "mill construction" and the protected steel frame structures is here strikingly shown. The sixteen-story Continental Trust Building, the highest building to undergo the ordeal, is a typical example of modern skeleton construction (having been built in 1902, 1903), with exterior walls of stone in the lower stories, brick and terra-cotta above, steel frame and terra-cotta floor arches and partitions. The exterior walls on all sides are provided with the largest possible window areas, to provide maximum light to all offices.

The exterior stonework in the lower stories, in common with the granite, sandstone or marble façades of nearly all other buildings which were exposed to fire, has suffered material damage and will require partial renewal. This is not so difficult nor so expensive an operation in a skeleton or "veneer" structure



THE CONTINENTAL TRUST BUILDING, WEST ELEVATION.
D. H. Burnham & Co., Architects.

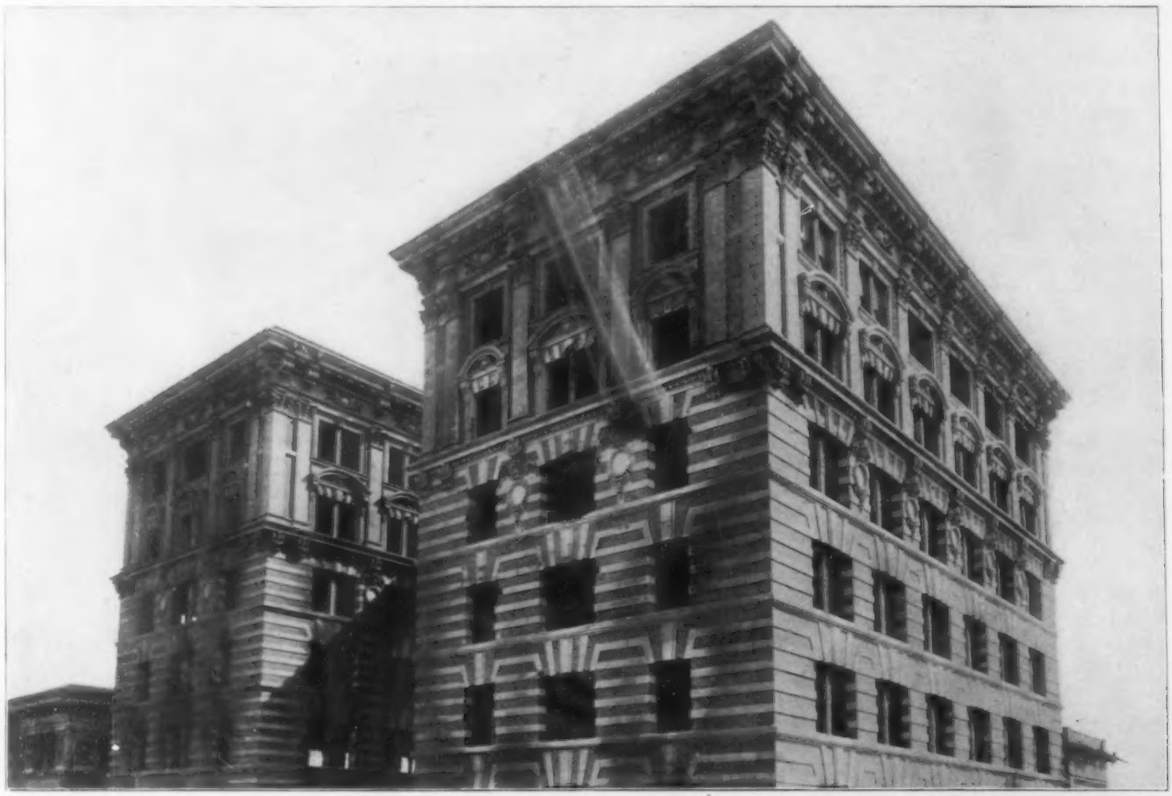
UNIV OF MICH.

as in those cases where the walls are solid or load-bearing, but the lesson is obvious, namely, that with the use of granite, sandstone or limestone, renewal *must* be expected after exposure to fire. This is certainly no new experience, as the damage to the marble front of the Home Life Insurance Building in New York established this fact most conclusively several years ago; but the many cases exhibited in the Baltimore fire bring home the fact as never before.

The brick and terra-cotta walls also show serious damage in many instances, due to the light construction employed and the absence of proper tying in and bonding, rather than to any fault of the materials themselves. The principal damage occurred in the rear and side court walls, where the buckling of T-shaped cast-iron mullions and the expansion of iron lintels served to push out the light veneer, thus detaching large areas of face brick from the brick backing. The metal wall ties used to secure the facing to the backing are still in place, thus proving that they are a poor substitute for "headers." The general condition of the exterior walls of this building would seem to warrant the conclusion that the veneer covering has been made too light, possibly in the attempt to provide a maximum of light for the interior, or possibly in the effort to economize to the utmost in available floor space. Had the enclosing walls been more substantial, with more attention paid to bonding and tying them more firmly to the steel frame, much injury would undoubtedly have been avoided. The steel frame has been declared practically perfect after a critical examination by the architect. A few slightly deflected beams are to be seen in the unfinished attic space, and some of the spandrel or lintel beams are warped and buckled, but it is publicly stated that the owners have relinquished *all claim* upon the insurance companies for any damage to the steel work.

Not a vestige of woodwork is to be seen above the first floor banking room. The wood floors and floor screeds were so thoroughly consumed as to leave but empty grooves in the cinders concrete filling, in spite of which the terra-cotta floor arches are everywhere intact. As far as the writer could learn, not a single safe fell, and even the scaling of any of the lower webs of the arch blocks was rare. A notable feature in this building was the uniformly intact condition of the plaster ceilings. Whether this was due to the character of the terra-cotta floor blocks, or to the mixing or application of the plaster, could not be determined.

A good example of false deduction from wrong premises is illustrated by a photograph which has been published and extensively commented upon, showing one of the basement corridor ceilings in apparently very bad condition, due to the presumed scaling off of the lower webs of the arch blocks under the test by fire. As a matter of fact, the present condition of these arch blocks is in no way due to the effect of fire, as the writer noticed this condition of the ceiling in question and made inquiries about it. The superintendent of the building stated that the damage was done during *building operations*, by the contractors for the marble work. Their figured headroom in the corridor was insufficient, so the lower webs of the overhead arches were trimmed away to allow the placing of the marble ceiling slabs. The failure of this marble work under fire exposed the previous damage done, and the present appearance is pointed out by unfair



DETAIL, THE CALVERT BUILDING.

THE CALVERT BUILDING, WEST ELEVATION. CHESAPEAKE AND POTOMAC TELEPHONE BUILDING.
Joseph Evans Sperry, Architect.

UNIV. OF MICH.

critics as a sample of the conditions existing *throughout the building.*

Of the terra-cotta block partitions few remained standing, at least along the corridors. This, as in almost every other fireproof building, was due to the use of wood sash or top lights, for transmitting borrowed light from the offices to the corridors. Far different conditions might have resulted in many of these buildings had the partitions been more firmly built, and provided with metal frames, wire glass, and stamped steel or other fire-resisting doors. Not only would enormous damage to the partitions themselves have been avoided, but it is very probable that such construction would have served so to break the fire into separate compartments (where the entire building was subject to a severe exterior exposure) as to greatly diminish the severity of the fire and its effects upon the structure attacked.

One of the most striking facts in the interior of the Continental Trust Building was the absolute destruction wrought in marble work by fire. Immense quantities of marble wainscots, bases, floors and stair treads were strewn in absolute ruin; hardly a single surface in its original position, save in the lower story. In some buildings the writer observed the curious phenomenon of warped or buckled marble, notably in the Union Trust Company's building, where large slabs of marble wainscot had bellied out, but without a crack.

Where used as stair treads and platforms the treads were generally cracked but passable, but platform areas were gaping voids. This was true in almost all of the prominent buildings, thus attesting the wisdom of the New York building law in requiring sub-treads of solid or perforated metal under all stair treads and platforms of slate or marble.

Another very interesting test of fire-resisting construction is to be seen in the twelve-story Calvert Building. This and the adjoining Equitable Building are both of even larger area than the Continental Trust Building, though not so high, and had it not been for the fire-resisting character of these structures and the Baltimore Herald Building, diagonally opposite the Calvert Building, there is little doubt but what the beautiful $3,000,000 Courthouse would have burned, and beyond that no one can even estimate how far the conflagration might have spread. Had these three buildings, the Calvert, the Equitable and the Herald, been of a like construction with the Law Building (directly opposite the west frontage of the Courthouse), which soon collapsed as a result of its "mill construction," nothing could have prevented the fire from crossing Fayette Street. But although completely swept by fire, these three buildings remain standing as a testimony to the value of fire-resisting buildings as a fire-stop. The only damage done the Courthouse was directly opposite the Law Building, where the marble cornice was calcined and some few windows burned out.

From a little distance it would hardly be apparent that the Calvert Building had been through a severe conflagration, were it not for the entire absence of window frames and sash, except two in the top story. A closer examination, however, shows that the stonework of the lower stories is considerably damaged, and that the brick walls with terra-cotta trimmings, in the open court over the front entrance rotunda, are considerably injured. This is undoubtedly due to the severity of the flames in sweeping out of the court windows against the opposite court walls, for the brick and terra-cotta street walls are in admirable condition and will require little repair to make them as good as new. In fact, court walls, where the flames could beat from the windows to near-by opposite walls, were almost everywhere damaged much more than was the case with the outside street-facing walls.

In this building, also, both the steel frame and the fifteen-inch semi-porous terra-cotta arches of end construction seem in admirable condition, considering the great evidences of heat everywhere apparent. Some of the floor arches have the lower webs scaled off, but the deep and substantial character of the arches should not only show them safe for renewal but render such damage as was done easy of repair.

On one floor, where large quantities of paper supplies were evidently stored, one column had settled about four inches from the extreme heat, after the failure of the column covering. From examples made apparent in this fire, it is evident that still more care is required in the construction of terra-cotta column coverings or casings. These should be built independent of adjoining partitions, so as not to be pulled down by possible faulty construction in the partitions, and they should also be made solid or backed up, so as to resist shock from falling material. Another point which has not generally been considered heretofore is the liability of waste or vent pipes, when enclosed within the column covering, to so expand from heat as to dislodge the enclosing blocks. If pipes are run within the casings, reasonable play should be allowed for such expansion, but the columns should preferably be cased first, and entirely independent of separate outside pipe chases. The interior partitions were also largely down, again owing to the introduction of wooden top-light sash.

The Equitable Building, ten stories high, corner of Calvert and Fayette streets, covers an area of nearly twenty thousand square feet. The exterior self-supporting walls of this building are in excellent condition, save the inevitable damage to portions of the granite work of the lower three stories, and a stretch here and there of the ornamental terra-cotta used as a trimming in the upper stories of buff brick; but the interior is practically worthless, save most of the cast-iron columns and a portion of the steel girders. This is due to three main causes: first, the steel floor beams and girders were designed too light for commendable construction; second, the floor arches were entirely too light and of improper construction; third, Lime-of-Teil or plaster block partitions were employed.

The interior iron framework consisted of cast-iron columns, spaced about 15 feet centers, with generally 9-inch beams spaced from 6 feet 5 inches up to 8 feet 2 inches centers in cases. This framework was, it is said, designed for a very light system of floor construction, but at the last moment it was decided to use terra-cotta, and a terra-cotta system was therefore devised to suit the conditions of the ironwork. This entirely reverses the usual procedure of designing the steel work to suit the type of floor construction actually used.

To make a terra-cotta construction light enough to suit the strength and spacing of the steel beams, it was decided to construct the floor arches of four-inch hollow terra-cotta partition blocks, laid end to end in the form of a segmental arch, the end or "skewback" blocks simply resting upon the lower flanges of the supporting beams, with a rise at the center of about four inches. Then, to economize still further, it was evidently thought unnecessary to fill in the haunches with concrete, for a rough flooring of two-inch plank was simply laid over the beams and upon a thin layer of cinders concrete at the crown of the arch. The inevitable result followed. On

THE MARYLAND TRUST BUILDING.
Baldwin & Pennington, Architects.

UNIV. OF MICH.

the burning out of the rough plank and finished flooring, the large number of private safes used throughout the offices in this building were allowed to fall or cant upon the terra-cotta arches, a considerable distance at the haunches, owing to the absence of the concrete which would have acted both as a filler and as a distributer. The floor arches were too light to withstand such shocks, or even such concentrated loads, and as a result many bays of arches are completely gone in all floors, and safes and vault doors are buried with other débris in the basement.

Another great fault in this floor construction lay in the fact that no adequate protection was afforded the lower flanges of the supporting beams; for while it was evidently intended to cut the skewback blocks so as to make small beveled lips to help support soffit tile, this was naturally found impracticable, and plastering was generally the sole soffit protection provided. This, and the falling of safes, have seriously deflected a large number of the floor beams, which will have to be replaced — with a better floor construction, it is to be hoped.

The interior partitions were built of Lime of Teil blocks, a variety of hollow plaster block. Many of the offices were only about seven feet wide, and the absolute failure of this material precipitated a great quantity of débris about the floors which remained, or into the basement. The material was reduced to a powdery and lifeless mass, through which the finger could often be pushed with ease. The same conditions applied to the partitions built of the same material in the Herald Building.

Conditions more similar to the Calvert Building or Continental Trust Building were found in the Maryland Trust Company's ten-story and attic building, in the Herald Building, in the Merchants' National Bank Building and others, but space does not permit of a detailed account of each. Conditions of great interest and value were to be seen on every hand, — strange freaks of the conflagration in passing by the frescoing of a reception room in one corner of the Continental Trust Company's building, while completely burning portions of the large banking room, also on the first floor; the effective protection afforded by metal sash and wire glass in windows on the rear of the Merchants' National Bank; the strange and fantastic forms to which incandescent lamps or lamp globes were reduced by the heat; the apparent uselessness of metal or tin covered shutters under conflagration conditions. Enough has been said, however, to indicate the very creditable showing made by the steel frame fire-resisting buildings, at least where the protecting terra-cotta was intelligently used; for not only did no steel frame and terra-cotta building collapse, but, saving the Equitable Building's abnormally light construction, no serious amount of reconstruction will be necessary in the terra-cotta floor systems, while several of the buildings will show a very considerable salvage on the partitions and column coverings. In one building particularly, the Chesapeake and Potomac Telephone Building, the side construction, heavy material, porous terra-cotta floors appear as perfect as the day they were laid, and the terra-cotta partitions also, built solidly to the ceiling, are both intact and rigid.

The Baltimore fire establishes the fact, beyond peradventure, that buildings can be built so as to be fire-resisting, at least as far as the structural entirety of the building is concerned; but that, to be most effective, fire-resisting structures must be made the rule and not the exception, thus mutually protecting one another.

It also teaches that this fire-resisting construction can best be attained through the use of terra-cotta and brick as protective media, but that even more care than is ordinarily given in present practice is necessary to secure the best results. Floor arches should be of heavier porous material, with thicker webs and partitions, and well-rounded fillets. The soffit protection of the beams should be more carefully looked to, and have, preferably, not less than one and one-half inches of terra-cotta, with an inside air space if practicable, and with no question as to the security of position. Partitions should be built solidly, upon the floor beams or arches (and not upon wood under-floors or cinders concrete), should be wedged at the top with slate chips to provide rigidity, and should have metal frames and wire-glass windows, and some form of metal-covered or incombustible doors. Column coverings must be built independent of partitions, as the failure of faulty partition construction was responsible for many cases of failure in column coverings.

Finally, still greater improvement is necessary in the further elimination of all possible combustible interior trim and fittings, if any security is to be provided for the contents of the building as well as for the structural parts of the building itself; and more thought must be bestowed upon the question of external hazard. The large unprotected areas of glass in modern design must be replaced by metal frames and sash and wire glass, or else the risk of serious damage from external exposure must be assumed with a full knowledge of possible consequences.

Wood Construction in Fireproof Buildings.

EXPERTS who have examined the remains of the Baltimore buildings are unanimous in condemnation of the extent to which wood was used in these buildings. The Alexander Brown Building appears to have been the only structure in which an attempt was made to use metal sash. All of the tall office buildings were equipped with wooden sashes and frames, wooden finish, wooden doors and wooden floors. The amount of wood was particularly exaggerated in the Equitable Building, which had a two-inch under-floor and a one-inch wearing floor, or the equivalent in every floor of 3 x 12 timbers, 12 inches on centers. In the Calvert Building there was a single flooring nailed to sleepers, but the finish in all these structures was not restricted in size and was sufficient in quantity to furnish abundant fuel for the flames. By actual observation the contents and fittings of the Calvert Building were consumed in three-quarters of an hour, while the Equitable Building burned for two hours and a half. It is contrary to reason to expect any structure with such quantities of wood entering into its finish to be in any sense fire retardent. We have spent a great deal of ingenuity and achieved marked success in fireproofing our frames and in constructing the exterior of our buildings, but in very rare cases have we gone the step further, which would seem so perfectly logical, and omitted entirely wood floors, to say nothing of omitting the wood finish. Until we can be content to use other material than wood for our interior finish and floors, we will be liable to disasters of this sort to our buildings. The Equitable construction was particularly aggravating, and one which no one would dream of using again.

THE HERALD BUILDING.
Joseph Evans Sperry, Architect.

UNIV. OF MICH.

The Protection to the Steel Construction.

BY WILLIAM W. CREHORE, M. AM. SOC. C. E.,
CONSULTING ENGINEER.

To the Editor of THE BRICKBUILDER:

It gives me great pleasure to comply with your invitation to review the Baltimore fire in its bearing on fire protection to steel construction.

The first important feature to be noted seems to be that this conflagration was very much hotter than any other of which any record is available, and naturally was hotter in some localities than in others. The fusing of the steel frames of typewriting machines into a shapeless mass of molten metal indicates a temperature of at least 2,600 degrees Fahrenheit. This is the fusion point of pretty hard tool steel, whereas the softer steel used for structural purposes requires a temperature of nearly 2,700 degrees Fahrenheit for fusion, it being the fact that the harder the steel the lower the fusion point is. The quality of the steel in typewriter frames is somewhere between these two, and would therefore require a temperature above 2,600 degrees Fahrenheit for fusion. As the heated air rises higher and higher in a tall building, accumulating energy from the combustion of its less lofty neighbors and being fanned by a furious draught from below like a huge chimney or blast furnace, it is not improbable that extreme temperatures were attained, in some places exceeding 3,000 degrees Fahrenheit, and continuing for periods of from one to three hours. To convey an adequate idea of the intensity of this heat, it may be noted that the temperature of the Bessemer converter at the end of a blow is 2,900 degrees Fahrenheit, and that of the open hearth furnace at the moment of casting is about 2,750 degrees Fahrenheit. The Department of Buildings in New York City has for several years required of all fireproofing systems a fire and water test in which the system must be subjected to a temperature averaging 1,700 degrees Fahrenheit for four hours and then must successfully withstand the application of a stream of water under sixty pounds' pressure continuing for fifteen minutes. Occasionally in these tests the temperature rises to 2,200 degrees Fahrenheit, the fusing point of ordinary cast iron, but usually 2,000 degrees Fahrenheit is not much exceeded, the assumption being that this temperature is very much above that of any possible conflagration. So much for the unusual intensity of the Baltimore fire.

Under the circumstances it is to be regretted that burnt clay was the only fireproofing material present in sufficient quantities to give value to any conclusions based on its performance. It would have been interesting and instructive to have had a fair comparison with other fireproofing systems under these exceptionally severe conditions. In order to appreciate the great value of terra-cotta as a non-conductor or fire-resisting medium, let us think of the terrific heat of this fire, — about 3,000 degrees Fahrenheit, — raging on all sides of a steel column which would bend under its own weight at a temperature of 1,250 degrees Fahrenheit, and yet which continues to carry a hundred times its own weight practically unaffected by the heat although separated from it by *only two or three inches* of terra-cotta. From our daily contact with different substances it is hard to imagine one that cannot conduct heat, or which does it so slowly at the high temperature of 3,000 degrees Fahrenheit that the amount is inappreciable after a lapse of time. Yet such is the performance of the terra-cotta which protected the columns and beams in some of the buildings in the Baltimore fire. A wonderful and highly significant performance it is, when one considers the probable fate at that enormously high temperature of a concrete system, two of whose constituent elements, sand and cinders, fuse at temperatures less than 2,900 degrees Fahrenheit.

It is not well to attach too much importance to the absence of the water test on this occasion, since such high temperatures are likely to be attained, if at all, only near the tops of high buildings beyond the reach of water pressure, even if it were possible for hose to be brought within range of such flames. It is, moreover, quite improbable that a stream of water could be brought to bear on a fire at 3,000 degrees Fahrenheit under any conditions whatever. Hence an inquiry as to how the material would behave in this event is unimportant.

The more minutely one studies the results of the Baltimore conflagration the more he becomes impressed with the remarkable power of burnt clay to resist high temperatures. The protected skeletons of many steel frame buildings which endured that terrific heat for hours and remain standing to-day practically unharmed, ready to be used again as originally designed, are monuments to the superb properties of terra-cotta as a fireproofing system. Whatever faults its critics may find with terra-cotta as a fireproofing system, the quality of the material itself for this purpose cannot be called in question. The friends of terra-cotta would do well, however, to open their eyes and hearts to well-meant criticism and to apply themselves at once to remedying defects in methods of construction and workmanship which are plainly apparent.

Quantities of flooring fell out and column covering peeled off because of poor workmanship in selecting and setting the blocks and leaving open joints insufficiently grouted. More than any other one thing such a showing as this tends to encourage competitors and to render the general public more and more timid about the use of burnt clay for floor construction. It furnishes some excuse for such silly and extreme views on the merits of terra-cotta flooring as one the writer once heard an architect express, viz., that in his practice when using terra-cotta floors he always made the sleepers strong enough to carry the load above and let the blocks drop out if they wanted to. To equal the quality of the material the best of workmanship is none too good. Competitive systems are laid by skilled workmen under careful supervision; why then should every small contractor or speculative builder be allowed to set his tile blocks in any way he likes, regardless of consequences and to the great injury of the manufacturer's reputation?

In many instances in the Baltimore fire the soffits of the floor blocks were destroyed and the covering over the soffits of the beams dropped away, leaving the arches otherwise undisturbed. This action was confined exclusively, so far as observed, to arches of end construction, and never happened to arches of side construction. It confirms other instances of the comparative behavior of side and end construction in a hot fire, and yet the end construction tests better when laid for the purpose. All this points strongly to the necessity for greater skill and care in laying the end construction than is usually engaged. The side construction blocks can be laid with smaller joints, because the sides of a block are straight and true, and close joints are desirable even with the very

THE UNION TRUST BUILDING.
Winslow & Wetherell, Architects.

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best of Portland cement in them, because if the adhesion be not perfect the joint is a very vulnerable point in a hot blaze. The end construction blocks, on the other hand, must be laid with cell opposite cell and web against web with great care, or else the stresses in the arch will not be distributed continuously over the skewbacks and tend to disrupt individual blocks.

Such disasters as the Baltimore fire always have been and always will be of great benefit to mankind in general. This one is so far from being an exception that it may become an exceptional benefit, and by the very fact that it was so severe its lessons will be applicable, if properly interpreted, in perfecting fireproofing beyond the limits of endurance required for ordinarily large fires, since it has furnished us with the results of a test of far greater intensity and severity than it would have been possible to make without enormous expense and loss.

Freaks of the Fire.

WHILE the Baltimore fire was apparently resistless in its might, it performed some very queer freaks, leaving untouched structures and objects which one would suppose would melt like wax, and utterly destroying others which seemed impregnable. Most of the electric light wires were buried in the ground, but the street lamps were hung from poles, and it was a frequent spectacle to see block after block of buildings entirely destroyed, with only partially consumed wooden electric light or telegraph poles at the junctions of streets.

In one story of the Calvert Building a single corner office was passed by almost untouched by the flames, even a drawing board and some paper tacked thereon not being scorched, while right next door and across the corridor every room was swept clean.

In another room in the same building every vestige of contents, of wood finish, and nearly all of the plastering even were absolutely annihilated, the partitions were down on three sides, but on the remaining partition, directly opposite the window through which the fire entered, one of the Johnson electric control thermostats was intact, with the mercury still in the bulb of the thermometer.

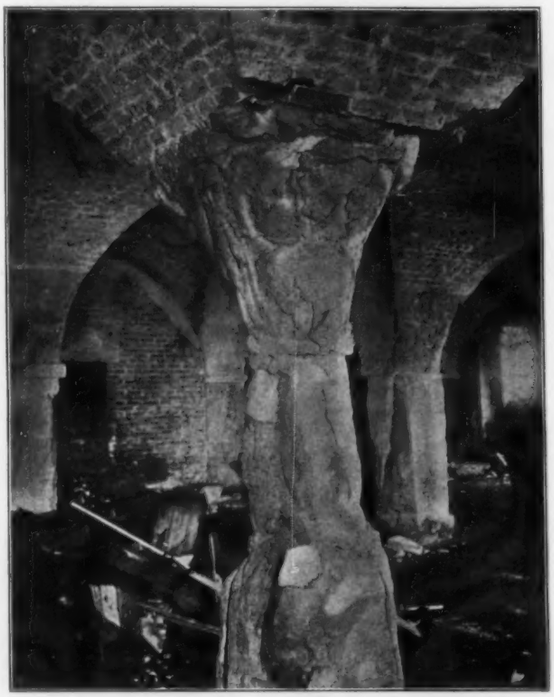
In the Continental Building on one of the upper stories the heat was so intense that a couple of typewriting machines were melted together in an indistinguishable mass right in front of a vault constructed of only four inches of terra-cotta, within which were preserved records, several thousand pounds of silver money, and books that were in no way injured.

The fire ruined every one of the elevator grilles in the Continental Building, broke up all the marble tiling, but in one story spared a considerable portion of the rubber mat in front of the elevator doors.

At the corner of Fayette and North streets stands still a three-story brick structure of very ordinary construction. The fire passed completely round it and left it with hardly a scorch on the paint and not a light of glass broken. The corner immediately below it to the south was the center of the newspaper district. On the southeast corner of Baltimore and South streets was the office of *The Baltimore Sun*, of which to-day hardly a vestige remains. It was one of the early iron-front buildings and was utterly ruined. Immediately adjoining it is the building of the Safe Deposit Company, a one story structure built externally of brick and stone, which is only slightly damaged. The interior of the structure reveals only the slightest traces of fire, and business could have been continued uninterrupted during the whole time of the fire, though everything was destroyed on all sides of it.

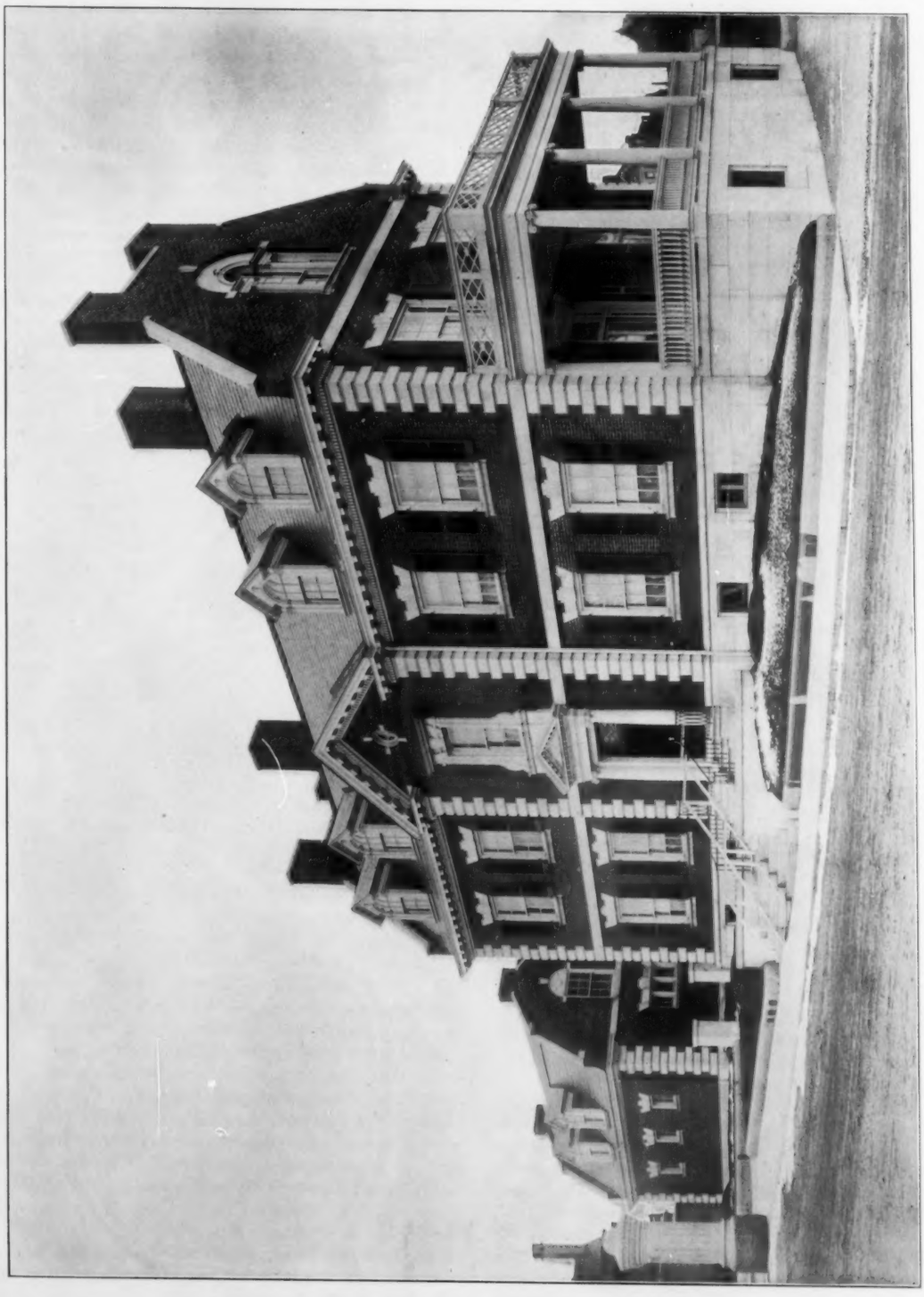
In one of the offices of the Union Trust Building a sample glass door knob had been placed underneath a safe. The glass was melted down into the body of the brass plate which held it, though the iron safe was practically uninjured.

In one story of the Continental Building a vault had been constructed of four-inch terra-cotta blocks in one of the offices. Inside of the vault was an ordinary fire and burglar proof safe. In the safe was a compartment containing a wooden drawer. In the drawer was a seal ring. When taken out after the fire the contents of the vault were destroyed, the safe was ruined, and the seal ring was melted down to a button of gold, though on the floor immediately above a vault of exactly the same construction was uninjured.



BURNT CLAY VERSUS STONE. GRANITE COLUMNS SUPPORTING BRICK ARCHES IN THIRD STORY OF UNITED STATES APPRAISERS' WAREHOUSE.

The fire ruined a considerable portion of the granite facing of the new Custom House under process of erection, but did not even break the glass in the little old-fashioned windows of the Appraisers' Stores, diagonally across the street. There are many other freaks which might be noted in connection with this fire which go to show that any estimate of the effect of this fire upon material is a false one, unless one takes into account the exact conditions to which the material has been exposed.



HOUSE NEAR DRUID HILL PARK. Joseph Evans Sperry, Architect.

Changed Views as a Result of the Fire.

BY JOSEPH EVANS SPERRY.

THE Baltimore fire has greatly modified my views regarding the best materials and construction for so-called fireproof buildings. It has fully demonstrated the folly of attempting to arrive at definite conclusions from experiments made in a small way to determine the resistance of building materials to fire.

About eighteen years ago, at the request of the Building Committee of the Mercantile Trust and Deposit Company, I made a fire test of several building stones, including granite, marble, limestone and sandstone, in order to select a suitable stone for their building. Cubes about six inches square were placed in a furnace, and two samples of sandstone from different quarries were heated to red heat and dropped in a tub of water; they both stood this severe test. The blocks of marble, limestone and granite were, of course, destroyed by the heat. Sandstone was used in this building which was set on fire in the late conflagration by bricks falling from the higher building on the north crushing through the skylight and leaving the room exposed to the burning materials which showered through the opening. A sandstone mantel in the president's room was completely destroyed by the fire, though no water was thrown on it.

I have always been a strong advocate of terra-cotta, not as a cheap substitute for stone, but as a legitimate building material worthy of an artistic expression of its own, and have watched the development of its manufacture with the greatest interest. Here I thought we had the real fireproof material; and though it has stood the fire better than any of the building stones, it has failed to measure up to expectations. This is not wholly the fault of the material: its failure is due in part to our method of construction. Thin shells of terra-cotta suspended from steel supports or resting on exposed ironwork is bad from an æsthetic point of view, and very bad when subjected to intense heat. The results of the fire convince me that it is most important to make architectural terra-cotta self-supporting, and to eliminate as far as possible the use of steel and iron in connection with it. The sills and key-blocks on the Calvert Building were evidently crushed by the expansion of the cast-iron mullions.

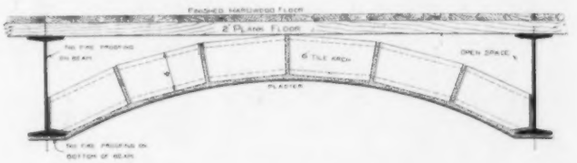
An interesting fact in regard to the Calvert Building is that on the west side, where the terra-cotta was gradually heated by the approaching fire, the damage is slight; and on the opposite, or east side, where the walls were chilled by the cold weather then prevailing, and subject to sudden and fierce heat through the windows of the burning building, the terra-cotta is badly damaged.

The terra-cotta on the Calvert Building has suffered more than the same material on the Equitable Building. Whether this is the result of the mixture of clay or the temperature at which it was burned, I am unable to say; both were made by the same manufacturer. About two-thirds of the terra-cotta on the Calvert Building is apparently uninjured, but this cannot be determined until a thorough inspection is made from a scaffold erected for the purpose. The terra-cotta remaining on this building can be readily cleaned by a sand blast, which will not injure its surface and will effectually remove all traces of the fire. The face bricks are badly damaged in places; and the fact that exposed cast iron in both buildings is fused will give an idea of the intense heat to which the materials have been subjected.

In regard to floor construction, partitions and column protection, I would advise the use of porous or semi-porous terra-cotta. The fire has fully demonstrated the value of this material. Hard tile has been damaged under the sudden expansion, and the bottom plates of the floor arches in large areas have been broken; this did not occur with the porous or semi-porous material.

I should also advise the use of side construction bonded floor arches. While the end construction blocks, if properly set, will carry a greater load, exact mechanical accuracy is required in the size of the blocks and in placing them in position, — both difficult to obtain in actual work.

With the exception of one column on the eighth floor, the structural steel in the Calvert Building has not been injured, and the column referred to can be replaced at a cost of eight hundred dollars. The cast-iron stairway has not been injured, and the elevator fronts but slightly damaged. Every particle of woodwork and other inflammable material in the building, except in one room on the third floor and two small rooms on the first floor, has been entirely consumed. The sleepers were bedded in cinders concrete, and the wood floor laid on concrete and nailed to the sleepers, there being no space left between the bottom of the floor and the concrete. The floor and sleepers were entirely destroyed, and not even a trace of charcoal or ash left. The furrows in the concrete where the sleepers had been are left perfectly



TYPE OF ARCH USED IN THE EQUITABLE BUILDING.

clean. If buildings are to be fireproof, all inflammable material, including wood frames and sash and wood floors, must be eliminated. If wood floors are demanded, however, I do not know any better way of laying them.

The fire has certainly shown room for improvement in the treatment of column casings. Many of these were damaged in the Calvert Building, where the effort was made to save floor space by placing the plumbing pipes and conduits for electric wiring in the recesses formed by the channel columns, and then covering both columns and the piping with the terra-cotta protection. Throughout the Calvert Building the wood boxes for the electric conduits were built into the column casings. These boxes were destroyed by fire on different stories, leaving an open flue between the column and column protection, which under some circumstances might have proved very disastrous to the steel. Fortunately, the only damage done was to the column in the eighth story, where the distortion of the pipes forced off the column casing and left the column entirely exposed. One effective way of avoiding this danger in future work, and at the same time securing protection against rust, would be to fill the space between the column and its protection with Portland cement mortar. This could easily be done, as the blocks are set around the column. After the blocks are in place they should be bound with wire before

being plastered. This method would give a cement casing to the column in addition to the terra-cotta hollow blocks. The pipes should be exposed, or have a separate casing entirely independent of the column protection.

The partitions in the Calvert Building have nearly all failed. They were built on the floor blocks in some cases, and in others on the cinders concrete filling. Their failure is due entirely to the wood framework around the doors and large window openings in the corridor partitions. I shall certainly try in the future to build partitions self-supporting, using as little wood around the openings as possible.

The failure of the terra-cotta floor arches in the Equitable Building, erected about thirteen years ago, requires a detailed explanation. The girder beams were designed by the architect to carry a total load of two hundred pounds per square foot, and the floor beams a load of only one hundred pounds per square foot, his intention being to use a Guastavino arch, transmitting a part of the load to the girder. Unfortunately, for reasons of economy, a different form of arch was adopted, and in order to reduce the weight as much as possible the haunches were not filled and the flanges of the beams were not protected. Over the arches, resting on the beams and the crown of the arch, a two-inch spruce floor was laid, and over this a finished floor one inch thick, leaving the terra-cotta as a mere ceiling arch. This system of construction has long since been abandoned, though I believe the two-inch under-floor is still being used in Boston.

In this building there was a total thickness of three inches of wood flooring over the entire area. If this flooring were cut in strips twelve inches wide and turned on edge, it would be equivalent to 3 x 12 inch joists placed 12 inch centers, — about as much woodwork as used in any ordinary warehouse. Portable iron safes were placed on the wood floors. As the floors burned from under the safes, they toppled over, in some cases carrying the arches with them from the top floor to the basement. The column casings and partitions were of Lime of Teil, and the ceilings in the first and top stories were of Mac-Ite boards. The Mac-Ite boards and Lime of Teil were entirely destroyed. The cast-iron columns were left entirely exposed, and one of the most remarkable exhibits of the fire is these columns which are apparently uninjured, except in the top story where three columns are distorted, one of which is partly melted No one would undertake to replace this obsolete form of floor and partition construction in the building. It is thoroughly illogical and bad, besides being far from fire-resisting.

In the interest of good brickwork it is well to note the effect of heat upon face bricks secured to the body of the wall by metal ties. In the Continental Building and in the court walls of the Equitable Building, where metal ties were used,

BUILT OF WHITE DULL-GLAZE TERRA-COTTA.

NATIONAL HOWARD BANK, BALTIMORE.
Joseph Evans Sperry, Architect.

large areas of the face bricks have fallen off, and most of those remaining are loose, necessitating their removal. Face bricks should be bonded to the body of the walls with bricks and not with metal ties.

The only buildings left standing in the burned district are the so-called fireproof buildings: all others have fallen or been pulled down. All the remaining buildings are to be repaired, and, in the light of our recent experience, will be far better than they were originally.

In discussing the many freaks of the fire we are told that certain buildings stopped the fire from spreading. The owner of a building on Lexington Street, opposite the Law

A NEW STORE BUILDING.
Joseph Evans Sperry, Architect.

Building, stated to me that his building with its wood cornice stood the fire better than the fireproof Courthouse, both being approximately the same distance from the fire.

The building on the corner of North and Fayette streets, with wood cornice and wood trims around the windows, is left standing, the fire destroying the buildings on the side and rear of it. The Safe Deposit and Trust Company's building on South Street, with the greater part of its roof of glass, is comparatively uninjured, and the stone on the front only slightly damaged — the same stone that is entirely destroyed in the Baltimore and Ohio Building.

The building on the north side of the transformer station on McClellan's Alley, with outside blinds of wood, is not materially damaged, though the building opposite and only twenty feet away is entirely destroyed.

In considering all these freaks it is well to remember the direction of the wind, which was blowing at the rate of about thirty miles an hour from the southwest when the fire started; when it reached Charles and Lexington streets the wind changed to the west, then veered to northwest and finally to north. The fire seemed irresistible, and nothing stopped it until it reached the water's edge. The heat was so great that plate glass began cracking when the flames were a block away. No water was thrown on any of the larger buildings while they were on fire, as the heat was so intense the engines could not approach near enough to render effective service.

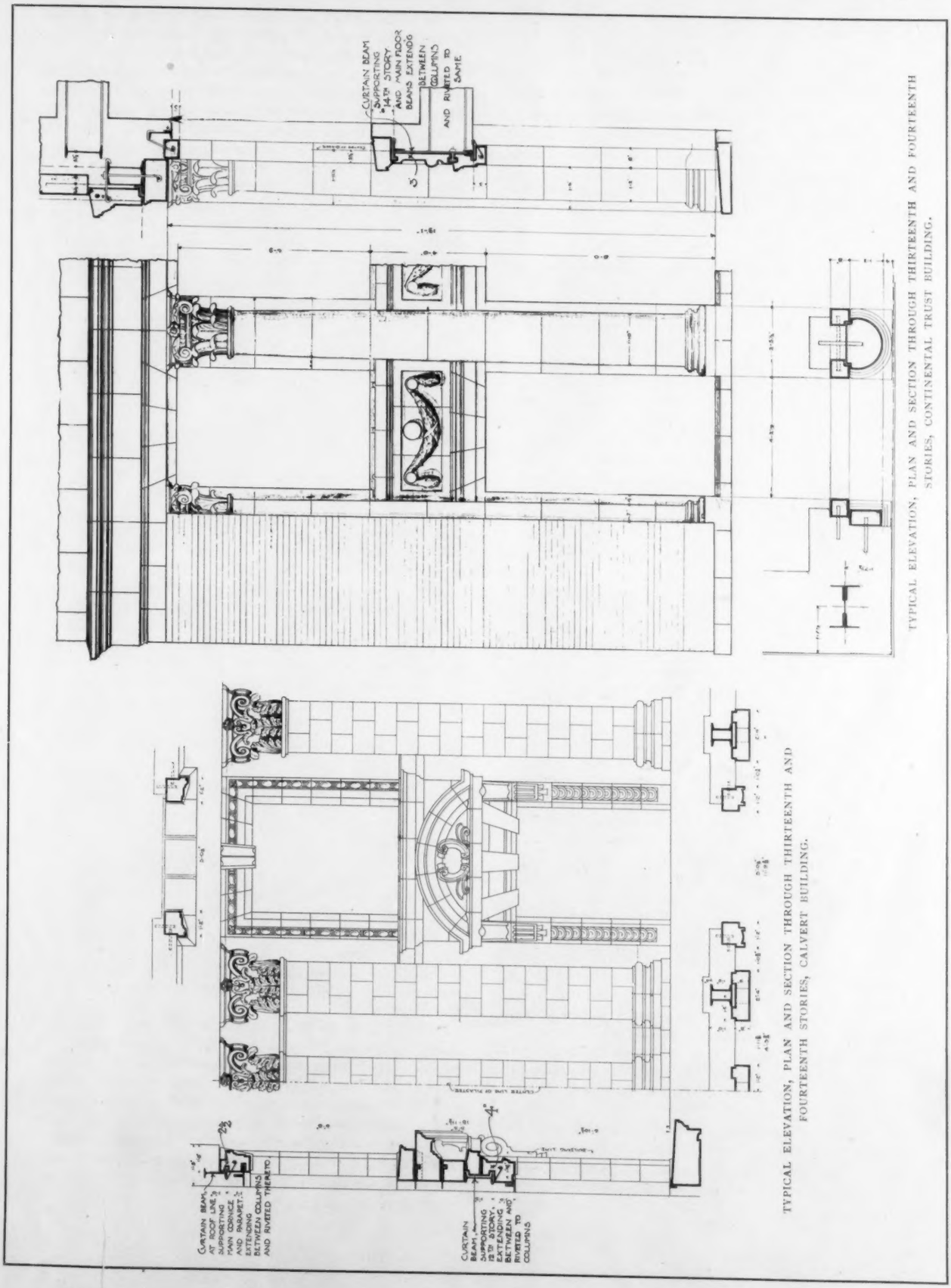
I regret that I am unable to give the exact percentage of damage to the buildings left standing. This is now being determined by representatives of the insurance companies and the owners.

The Protection given by the Exterior Terra-Cotta.

WE illustrate herewith the wall construction of portions of the Continental and the Calvert buildings. These drawings will be of special interest as showing the extent to which the architectural terra-cotta served as a protection for the framework of the building. It will be noted that in the Continental Building the curtain beam between the thirteenth and fourteenth stories, which is riveted at each end to the wall columns, and which directly supports the floor beams, is run in the panel sections between the terra-cotta columns within three inches of the face of the terra-cotta. Had this architectural terra-cotta not properly withstood the tremendous fire test to which it was subjected, these curtain beams would have been exposed, thereby endangering the structural steel frame of the building. It must be remembered that the fire at this portion of the Continental Building was so intense that on the north front the columns shown in this illustration were quite ruined in places, the material spalling off in large fragments. The spandrel sections were badly burned in places but effectually preserved their shape and position and protected the steel.

By reference to the detail drawing of the Calvert Building it will be seen that similar conditions therein existed. The spandrel beams were four inches from the face of the terra-cotta, and in no case were any of the beams exposed as a result of the terra-cotta yielding. The columns of the steel frame, it will be seen, were protected only by the eight-inch terra-cotta pilasters, and had these yielded the steel columns would have been exposed.

Considering the fact that the portions of the exteriors of these buildings shown by the drawings received as fierce a heat as has been noted in any part of the fire, it will readily be seen that the architectural terra-cotta should have a large credit for having properly protected a most important part of steel structures, and that this test really came before the interior structural coverings had received their fiercest attacks. Had the architectural terra-cotta not so fully performed its work in this respect, the damage to the interior structural steel work would undoubtedly have been much greater than it was; and from all the indications which have been observed, stone work in similar relation to the structural steel work would have been of no value whatever.


CURTAIN BEAM SUPPORTING 14TH STORY AND MAIN FLOOR BEAMS EXTENDG BETWEEN COLUMNS AND RIVETED TO SAME
CURTAIN BEAM AT ROOF LINE SUPPORTING 14TH STORY AND CORNICE AND PARAPET EXTENDING BETWEEN COLUMNS AND RIVETED THERETO
CURTAIN BEAM SUPPORTING 13TH STORY EXTENDING BETWEEN AND RIVETED TO COLUMNS

TYPICAL ELEVATION, PLAN AND SECTION THROUGH THIRTEENTH AND FOURTEENTH STORIES, CONTINENTAL TRUST BUILDING.

TYPICAL ELEVATION, PLAN AND SECTION THROUGH THIRTEENTH AND FOURTEENTH STORIES, CALVERT BUILDING.

The Test of Fireproof Construction at Baltimore.

BY CORYDON T. PURDY, C. E.

THE art of fireproofing is not practised as well as it is understood. That is probably due to two reasons: the importance of good fireproofing in a steel frame building is not appreciated as much as it ought to be; the advantage of good protection to both beams and columns is not realized. Then there is the other reason almost always in evidence, — the pressure to keep the cost of the building as low as possible. In general, owners of buildings are not willing to spend as much money in fireproofing as really first-class work requires. Occasionally an architect is instructed to design a building just as well as he knows how, but such instructions are exceptional. If the importance of good construction was more widely appreciated, probably there would be less pressure to reduce the cost by economizing in this particular.

Some men will take chances anyway, but better work would probably be done in many cases if the owners and the architects concerned fully appreciated and realized to how great an extent the security of the entire property depended upon this particular department of the construction. We do not want fires to occur for our education, but we ought to get from them when they do come a new realization and a new appreciation of the office which fireproofing material is designed to fulfill, and a great fire like that of Baltimore ought to be followed by better construction in many particulars.

The Baltimore fire does not afford us as many opportunities for comparisons as some other fires have offered, but there were more steel frame buildings in this fire than were ever burned before at one time. We will not be able to learn so much from it, but the need of building well ought to be emphasized by this experience as the subject never was emphasized before.

There are various objects to be accomplished in the use of fireproofing material, and the man that designs wisely will recognize them all. It is very easy for us to get interested in some particular consideration of the matter, and become entirely forgetful of the others. This is particularly true of the covering of columns. Again and again column covering is designed with reference to the protection of the column from fire, without any thought that the fireproofing ought also to protect the column from corrosion.

A good fireproof floor as ordinarily used in large city buildings should —

First. Be strong enough to carry its load with the required factor of safety.

Second. It should provide a continuous level ceiling.

Third. It should fully protect the beams from injury by fire, and particularly the lower flanges of the beams.

Fourth. The character of the material should be such that the arch itself will not be injured by fire.

Fifth. The construction as a whole should afford a good protection to the beams against corrosion. If the arch is not sufficient in all these respects it does not come up to the mark of good construction.

The arches in the Baltimore buildings, excepting in the Equitable, were satisfactory in the first two respects, and fairly so in the third respect. In the fourth they proved to be unsatisfactory; and in the fifth, of course, the fire put them to no test.

It is the writer's opinion that the semi-porous material will preserve its own structural integrity much better than the hard material used in these buildings. It is true that in every case the arches were still able to carry their load; but in every building the ceilings will have to be reënforced, more or less, with metal lath if the old arches are retained. The broken floors in the Equitable Building prove nothing either for or against the use of tile, except that a tile arch will not withstand a falling load. Where the arches in this building were not injured by the safes nor by bent beams, they remained intact. The condition of the floor, however, emphasizes the fact that the bottoms of the beams must be protected, just as the same fact has been demonstrated again and again ever since beams were rolled, half a century ago. In this building they were designed for a Guastavino arch, but a five-inch segmental arch was used instead; then, to prevent overloading, the floor was finished with a two-inch plank and one inch of flooring, without any filling material between the arch and the plank, while the bottoms of the beams were not covered at all. The plastering followed the soffit of the segmental arch.

The best protection against corrosion is Portland cement mortar; and if arches are well laid in that mortar, with a layer of the mortar between the fireproofing and the beam at every point of contact, the maximum protection against corrosion will be obtained. The weak point in this particular in every tile arch is the bottom of the flange, and that is often the most exposed part of the beam. In ordinary buildings there is not so much danger of corrosion in the ceiling as there is of corrosion on top of the beam, particularly around column connections; but over rooms used for kitchens or over boilers or places where gases are generated or steam escapes, the bottom flanges of beams are particularly exposed to corrosion. In such places the ordinary tile covering on the bottom of the beam, without any mortar behind it, is a construction that should not be allowed. In more than one case that has come under the writer's observation beams in locations of this character have corroded so badly on their bottom flanges that their strength was materially depreciated.

Column covering was often badly done. It is only now and then a building where real good work in that respect is undertaken. It seemed to the writer that the building in the Baltimore fire that had the best column covering was the building that suffered most, the Union Trust Building. When he examined the building, a few days after the fire, the column covering almost everywhere remained intact. Good work in this respect requires:

First. That nothing should be covered by the fireproofing except the column.

Second. That the space between the covering and the metal should be solidly filled with Portland cement mortar or fine concrete.

Third. That the space around the bottom of the column should be made entirely of concrete, in order to afford the largest possible protection against corrosion. There is no place where fireproofing is so easily injured by water as around the base of a column, and no place where it is more important that corrosion should be prevented. There can be no objection to omitting the fireproofing for the first few inches above the finished floor on the question of fire protection, because the exposure to fire at this point must always be comparatively slight.

Fourth. The writer also believes that it would be well to wrap all the columns, after they are fireproofed, with wire. If some method could be devised for tying or binding the different blocks together, the object of using the wire would be obtained. It is particularly noticeable that fires often loosen the blocks. Simply breaking joints in the ordinary way does not seem to be sufficient structurally. In nearly all the buildings in Baltimore the column coverings were more or less injured by the fire. It is true that in almost all cases the columns were not injured, but the covering of the columns was not perfect, not even reasonably perfect. If all the points named above had been covered by the specifications, the result would have been altogether better, in fact probably no column would have been uncovered, to say nothing of being injured.

As a whole the fireproofing may be said to have protected the steel frames in the Baltimore buildings, and to that extent it may be considered a success. The fireproofing, however, ought to have remained intact everywhere, but it failed to do so, largely because the hard material was used instead of a semi-porous or porous material. Elsewhere it was due to the bad use of the material. Of course, the complete protection of a building from fire involves other and serious questions. It involves the protection of windows, the making of borrowed lights fireproof, and the use of little or no combustible material in the finishing of the building; but if the building is not to be made fireproof in these and other important respects, there is all the more reason why the fireproofing in the building should be made the best that it can be.

INTERIOR VIEWS, THE HERALD BUILDING.
Showing complete destruction of everything except the burnt clay fireproofing, which enveloped the structure.

The Test of Building Materials in the Baltimore Fire.

BY J. B. NOEL WYATT.

SOMEBODY has said, perhaps it was Dr. Holmes, that the surest way for a man to perpetuate his name for all time would be to scratch it on a teacup and have it baked, on the same principle that led the ancient Egyptian to consign his last will and testament or his love letters to the surface of a brick, and very much the same results would follow as obtained in Moore's famous bit of bric-a-brac, when he tells us,

> "You may break, you may shatter the vase if you will,
> The scent of the roses will hang round it still."

This is the story of terra-cotta in a nutshell, and the story of the Baltimore fire does not apparently contradict the general theory and actual fact, however devoid of the poetic sentiment. But the Baltimore catastrophe has also a somewhat biblical characteristic, in the fact that, by reference to isolated instances, as to separate paragraphs alone, without the aid of context, almost any one of many conflicting and contradictory theories or facts, which an advocate starts out with, may be more or less definitely proved or disproved, at least to his own satisfaction.

An illustration of this is the behavior of granite, and indeed of all other stones, under the extraordinary tests they have just been subjected to here, and as examples one may cite two buildings situated within two blocks of each other, the First National Bank on South Street and the partially completed new United States Custom House on the corner of Gay and Water streets, the work on which had attained about the same height as the bank building. All buildings on either side, in the rear and opposite to both of these structures, were destroyed, but the front wall of the bank is standing apparently intact, so far as the condition of the granite is concerned, while the stone of the Custom House is so defaced that a bill is now before Congress to reimburse the contractors for the loss to the amount of $200,000, and the walls of this building had only reached a comparatively moderate height, no part was enclosed or under roof, and therefore not subjected to any heat from within.

The same conditions may be shown to exist in regard to white marble, strikingly illustrated in the walls of the Courthouse, which, with the exception of the west façade, was entirely uninjured. The fire raged directly opposite on both the west and south sides, in some of the tallest buildings of the city, where the heat was most intense; but while the marble of the west front crumbled and chipped and flaked off to the extent of forty or fifty thousand dollars damage, the south side shows no trace of injury of any kind. In separate buildings white marble tells the same story; the walls of the majority of them have entirely disappeared, while the entire front of the new Commercial and Farmers' Bank is standing with comparatively little injury. All this apparently conflicting testimony can, in most cases, be explained by the different degrees of heat and length of time the several buildings were subjected to it, under varying conditions recognized on closer consideration, such as even slightly differing widths of streets, different heights of surrounding buildings and the nature of their contents, and, most important of all, the temporary shifting of the direction of the wind from time to time during the fire.

When we remember that the origin of the whole enormous catastrophe was the sudden bursting into flames of a very large warehouse, in which a fire may have been gathering force for hours previously, followed by violent explosions, scattering burning brands over wide area in the teeth of a strong wind, bearing the flames into the most compactly built section of the city, where big warehouses and great office buildings filled with every kind of burnable material were surrounded by a mass of old structures, which although not of frame were veritable tinder boxes; when we know that in many instances glass fused and at some points cast iron melted and where also such "freaks" are reported as that of a row of water pails, water and all, standing undisturbed in a room where a safe became red hot, or of the old frame shanty immediately opposite to where the conflagration burst out catching fire and going out again (while "fireproof" or "slow-burning" buildings near by were in process of utter annihilation), we realize that while all these conditions and results, as noted above for other materials, must necessarily have obtained in varying degree in the case of all brick and terra-cotta work throughout the burnt district, it is manifest that it was subjected to extraordinary ordeals and peculiar phenomena which have had no exact precedent and which it is devoutly hoped by the law of probabilities will not occur in the same combination again, and from which it is impossible and unnecessary to formulate any very accurate statistics for future guidance *under similar circumstances*. Among the many buildings where terra-cotta constituted an important part of the structure in various forms and quantities, THE BRICKBUILDER would have no difficulty in pointing to numerous instances where it bore the test apparently unharmed, while the owner of a granite, marble or sandstone quarry might lead one around the corner and point to examples of quite different results. The important point, however, is this: what lessons may we learn, what positive opinions can we form and what accurate deductions can be made in regard to the use of terra-cotta as a non-combustible building material under conditions not utterly abnormal, but altogether possible, and which may occur at any time in any city, and the actual facts by the consensus of opinion of those who have examined the conditions most carefully seem to be these: While it has been found that other materials, granite, marble and sandstone, have gone through a process of almost entire destruction, wood of course disappearing, and unprotected iron acting as was naturally to be expected, brick and terra-cotta, while in many instances broken, defaced and otherwise injured beyond possibility of continued use, have in many other instances been so little harmed that they may be left in position with little repair beyond cleaning, and much of this was about the upper part of the buildings, where the fire was fiercest (it generally attacked the highest points and burned downwards), while other material succumbed near the ground where the heat was less intense. And just here it may be noted that as the revised building laws will probably prohibit for the future the use of all wooden "outlooks" or framing for sheet-metal cornices, the difference in cost between the metal and terra-cotta may be sufficiently lessened to lead to a more general use of the latter in cornice work than heretofore. Another fact is that while other materials disintegrated readily when only one flat surface was exposed, brick under the same relative conditions was in majority of cases only destroyed when it showed more than one exposed surface, such as jambs, angles or projecting moldings, etc., etc. This, however, may be partly accounted for by the differing texture of the bricks used at different points in the same wall, for it has

been very generally noted that the more ordinary brick, that is, the more porous and less compact (and this also obtained for terra-cotta), was the better preserved, as illustrated in cases where a rear or side wall, of a cheaper brick, and regarded as "inferior," showed much less signs of injury, though subjected to greater heat, than the more expensive finer quality and more ornate front walls of the same building.

The simple conclusions to be deduced from these facts are these: first, that as yet science knows of no materials or methods of construction capable of withstanding such a conflagration as has lately visited Baltimore; and next, that among the so-called "fireproof" materials brick and terra-cotta are better than others, and with them, used alone or in combination with metal framing, in approved methods, better architectural results can be obtained, both in construction and ornamentation, and at less expense, than can be had from other tested materials now in general use.

Great catastrophes and emergencies are great levelers in all fields, in the material world as well as the moral, and we are apt to find in both physics and ethics that there is not quite as much difference between the very good and the very bad as we had thought there was; the sinners are not entirely depraved and the saints not perfect, and architects and builders, like other ordinary mortals, can only take what intelligent observation seems to point out as the best.

Wire Glass.

THE Baltimore fire has again demonstrated the value of wire glass as a fire retardent. The rear windows of the Alexander Brown Company Building, a one-story structure, were glazed with wire glass in large sheets. The action of the fire softened this glass so that it crumpled on itself and slid out from the grooves of the metal sash, but before doing this it served as an excellent retardent of the fire and undoubtedly saved the interior. On the roof of the Continental Trust Building there were two large skylights both glazed with wire glass. One was over a series of lavatories which had only one small window to leeward of the fire and was not injured at all by the fire; even the woodwork of the water-closet seats and the paper were not touched. The other skylight was over a storeroom, and fire was communicated from the rear windows to this space, so that the glass in the skylight was subjected to intense heat on both sides. It melted and dropped out, allowing the room below to be entirely wrecked, while under exactly similar external conditions the glass in the other skylight was not injured at all.

It is the general feeling that an office building properly equipped with wire glass windows would have been a very effectual bar to the spread of the fire.

THE ARUNDEL APARTMENT. Wyatt & Nölting, Architects.

A Lesson from the Remains of the Baltimore Fire.

BY J. HOLLIS WELLS, C. E.

THERE are many lessons to be learned from the Baltimore fire. Marble, granite, limestone and, in some instances, ornamental terra-cotta, in the order named, have been destroyed. Brickwork, where properly laid in cement mortar and bonded, has withstood the ravages of the fire better than any other material, and in many instances, when cleaned off, will require no further repairs than repointing. Iron shutters, mullions and window frames stood not at all, and the flames swept interior and gutted it from cellar to roof

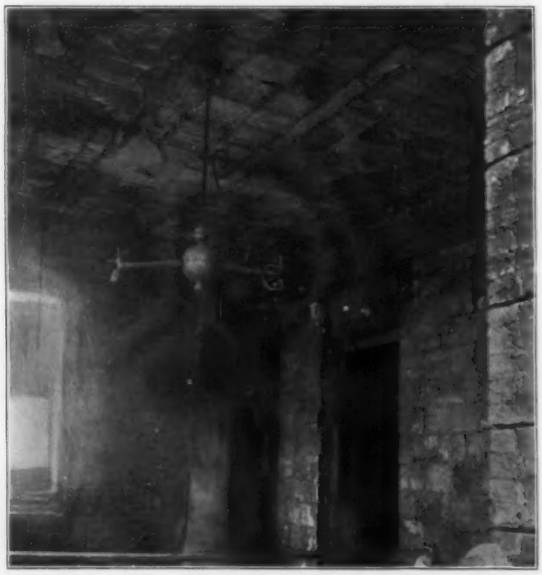
VIEW OF THE FIRST FLOOR OF THE CONTINENTAL TRUST BUILDING, SHOWING THE EFFICIENCY OF THE FIREPROOFING.

of every vestige of woodwork or other inflammable material. And yet the skeleton of steel work stands erect and practically uninjured. That modern methods of fireproofing the steel work in the floors and round the columns are success was demonstrated beyond peradventure.

In all of the high buildings a burnt clay arch has been used, and in some of the buildings it has stood the test better than in others. That this is due to methods of construction and to the materials used there is no doubt. In one building a six-inch segmental arch was used with no concrete filling over it. A heavy plank floor was laid over the top, and where this was burned away the floor beams deflected and nearly the entire interior ot the building was destroyed. This is the only instance in which there is evidenced any material injury to the steel work. It was not the fault of the materials used, but of the way in which they were used. In the other fireproof buildings where hollow tile arches were used the blocks were either of the hard burned material from Ohio, light in construction and inferior in design, or of the semi-porous Pittsburg manufacture, somewhat similar to the tile used in the East. The Ohio tile has stood up wonderfully well, considering the thin flange and single web, but much of it must be replaced in reconstruction. It has served its purpose, however, as a fireproofing material, but it does not compare favorably with the eastern tile. It would be ridiculous to say that the floor systems are intact. There is no question that on some floors where the fire was the hottest the mortar between the blocks has been destroyed and there is no bond to speak of. This, however, is again a matter of construction, and had the work been more carefully laid up in the first instance, and with proper cement mortar, the greater the salvage would have been.

It is the same old fault, careless bricklayers with ever ready hammers, improperly wedged keys, and badly bedded soffits; it is wonderful how well it all stood.

A most self-evident fact, even to the casual observer, is that of all the materials used for column covering the only one that stood the test at all was hollow tile, and where this was properly set, with at least three inches of thickness round the column, it stands intact. There are many instances here, also, of bad construction. In one case, where the columns were furred round in order to obtain a minimum diameter, the edge of the Z bar flanges was flush with the furring, leaving a straight joint from floor to ceiling. These joints opened, the covering fell off, leaving the columns exposed. Fortunately this happened generally on the first story, where the heat was least fierce. Again, heating and other pipes were built in, not behind, the covering, and per-



A ROOM IN THE MERCHANTS' NATIONAL BANK BUILDING, SHOWING PERFECT CONDITION OF THE FIREPROOFING.

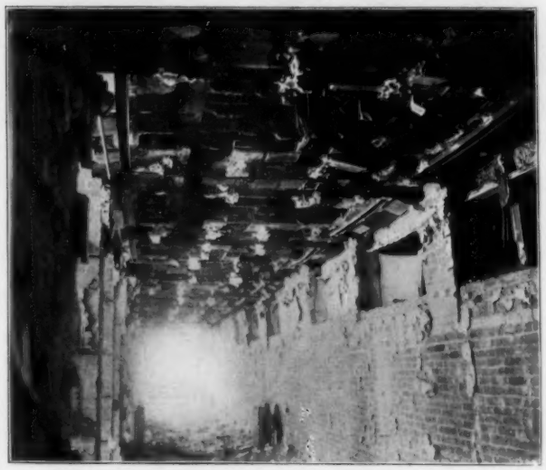
haps a bare three-quarters inch of material covered the pipe. In every case this opened up a joint and the covering has fallen away.

In the largest of the buildings fireproof safes built of hollow tile are intact, except in one instance where many valuable war records were lost, unfortunately. A wooden closet was built adjoining this vault, and a wash basin with its plumbing pipes was installed. Careless plumbers and wood workers cut away tile, and what little was left cracked and fell away, and the result was total loss.

Long and unbraced lengths of partitions were thrown down; burned floors, wood bucks and heads dropped others, so that a small percentage of the partitions remain intact.

Hollow partition blocks made of plaster and cinders have been utterly destroyed, as are also metal lath partitions. Hollow tile blocks, except where broken by the fall, can be used in rebuilding. The deductions, therefore, to be made are these:

First. That in a hollow tile floor system the end construction semi-porous blocks, laid up in full beds of Portland cement mortar, will be fireproof and strong enough to resist intense heat successfully. These blocks should not be less



THE CORRIDOR OF THE CONTINENTAL TRUST BUILDING. CEILING, WALLS AND FLOORS FINISHED IN MARBLE.

In fastening the marble to the ceiling, holes were broken into the terra-cotta hollow tiles, which weakened them considerably under the conditions imposed by the fire and caused their lower surface to fall with the marble. The steel bars, which also held the marble in place, twisted considerably when left exposed to the fire.

than eight inches in depth and should be well wedged in with slate.

Second. That soffits and flanges of all beams and girders should be protected.

Third. That column covering should be of hollow tile not less than three inches in thickness, and that this covering should cover all pipes at columns.

Fourth. That partitions should be of hollow tile not less than four inches in thickness, and should start on a firm foundation, preferably on top of the arches.

Fifth. That wooden floors and sleepers should not be used in high buildings. The floors should be of cement or some other fireproof material.

It must again be said that hollow tile construction has proven its worth as a fire resistant. The test was as severe as could be, and had the general work of setting equalled the materials used, the salvage would have been very much greater. That the arches stand at all where the fire was hottest and walls and partitions fell upon them is astonishing. That the skeleton is intact is wholly due to the brick and hollow tile encasing the beams, girders and columns. Let us hope that constructors will profit by the lessons taught, and that the buildings erected in the future will show that, with a large experience, has come a more conservative and painstaking spirit. There is no reason why a single beam should deflect or an arch collapse where honest labor has been performed.

Slow-Burning Construction.

THE Baltimore fire, while frightfully destructive of property and seemingly irresistible in its progress, was not particularly rapid in its spread, notwithstanding the high wind which was raging at the time. The total distance traveled in an air line was hardly more than a mile, and the fire was about ten hours in covering this distance. The reason for its irresistible quality is found in the quantity of inflammable material spread along its path, which constantly added fuel to the flames at a rate which made it impossible for any fire department to stand against them. We are not prepared to say whether or not there was any building of so-called slow-burning construction in this fire. If there was, it shared the same fate as the most shoddily constructed shanty. There was one building which was equipped with outside sprinklers which has been quoted as an example of resisting the fire most successfully, but this was on the northerly edge of the fire district, and the wind shifted early in the course of the conflagration, so that this particular structure, while truly protected by the sprinkler service, might have been saved even without it, but of slow-burning construction not a vestige remains anywhere. It is a favorite argument of those who advocate mill construction that a fire will not spread readily downward through solid wood, that in fact a heavy plank floor is a very efficient fire-stop. Indeed the building laws in some cities try to recognize this by allowing the omission of certain fire stops on the floors when the planking is sufficiently thick and the ceiling is unplastered beneath. That this is rank fallacy is abundantly demonstrated by the Baltimore fire, for not only did the fire absolutely consume from two to three inches of solid wood in close contact with a cement floor, but even ate out every trace of the sleepers underneath and licked into every corner to find out and consume utterly the last splinter of wood. Any construction which employs wood cannot fairly be called slow burning in the face of the testimony here of-

"SLOW-BURNING CONSTRUCTION."

fered, and even in a slight fire any one who undertakes to assume that fire will not spread downward through even a solid wood floor several inches thick will have to reckon without the light of the Baltimore experience and will be woefully deceived.

The fact is we are approaching a state of perfection, from a fireproofing standpoint, all too slowly when we ignore the lessons of this and other fires and continue to erect buildings of slow-burning construction in the business sections of our cities.

Structural Steel Failures in the Fire.

A STUDY of the effects of the Baltimore fire would be incomplete without some account being taken of the extent to which structural steel failed. The easterly wing of the eighth story of the Calvert Building was occupied by the Baltimore and Ohio Railroad Company, and at one point documents, files, etc., were piled from floor to ceiling for a considerable distance around one of the columns. This column was protected in the usual manner by terra-cotta, but the casing had been cut away to receive the wooden electric cut-out box. The fire was burning around this column for about four days with great intensity. The wooden cut-out box was speedily consumed, leaving a gap in the fireproofing which soon became enlarged until nearly all the blocks were dislodged. The heat was so intense that the column, which was constructed with two channels and two plates riveted together, was thoroughly heated at one point and gave way, allowing the plates to buckle and the flanges of the channels to straighten out. It is a property of iron that it expands under heat, but does not necessarily come back to its original dimension upon cooling; and though this column was so weakened by heat as to give way in the manner described, the actual settlement to the building was only trifling. Mr. Sperry, the architect of the building, has obtained an offer from a reliable contractor to repair all of the damage caused by the failure of this column for $800, and that is the total extent of the structural damage to the Calvert Building.

In the Equitable Building the floor construction consisted of terra-cotta arches turned between the beams, as explained by Mr. Sperry in his article elsewhere in this issue. This is considered a very defective construction. Probably twenty-five per cent at least of the girder beams in this building will have to be replaced and about ten per cent of the smaller floor beams. There are also two columns somewhat injured by the heat. The walls are self-supporting, the floor columns being placed just inside of the outer walls. One of the columns is squashed out of shape, much like the column in the Calvert Building. With these exceptions, however, the structural work in the Equitable Building is in good condition.

The only damage to the structure of the Maryland Trust Building was in the attic roof space, where there are some long columns consisting of two light channels bolted back to back, without any fire protection. Around one of these columns a mass of books or papers had been stored which was entirely consumed, heating the column so that it settled into the shape of a letter S, letting the roof down nearly a foot at this point. The column, however, did not entirely yield and no further damage was done to the frame.

In the Continental Building the windows on the rear were quite close together, being separated only by cast-iron mullions. These mullions were badly bent out of shape by the action of the fire, and in bending in some places pulled off the brick facing of the spandrels, and some of the spandrel beams are slightly bent and need to be replaced. Otherwise the structure of the Continental Building seems to be in perfect condition.

The above includes, as far as is known, all of the structural damage to the framework of all of the steel frame buildings which passed through the fire, and is a remarkable testimony to the efficiency of the fireproofing systems employed. The total cost of the six tall fireproof structures we have particularly discussed was something over four million dollars. Of this amount the steel was represented by at least $200,000. The combined damage to the frames caused by this tremendous conflagration was less than five per cent, and had the construction been throughout as well protected as it was in the Union Trust, the Telephone and the Herald buildings there would have been little or no damage.

So-called Fireproofing Material Which Failed.

AT the time the Calvert Building was erected it was anticipated that the supply of offices would be greater than the demand, and consequently in many of the stories the partition work of terra-cotta, which had been originally provided for, was omitted. After the building had passed out of the hands of the architect the owners had an opportunity to purchase quite a quantity of Mac-Ite and Lime-of-Teil partition and floor blocks. These were stored in an unfinished room in the basement, and the supply was drawn upon from time to time for a certain amount of partition work in the offices as rented. The action of the fire upon these materials is exactly what would have been expected. Diligent search failed to find a single block of sufficient strength to hold itself together. Wherever the fire had struck, even in a slight degree, the material was so soft that one could walk right through it, and in the pile in the basement some fireproofing experts amused themselves by thrusting a sounding rod clear through a solid mass of the material without encountering any resistance. None of the Lime-of-Teil or Mac-Ite partition blocks remained in place, and as they fell upon the floor from the impact of the fire they were broken into indistinguishable fragments. This is one of the materials which absolutely failed to stand fire.

In nearly all of the buildings the finished floor boards were nailed to sleepers bedded in a filling of cinders concrete over the terra-cotta arches. This concrete in the Calvert Building is so soft, as a result of the fire, that in walking across it the hollows left by the comsuming of the sleepers are crushed out of shape and most of it everywhere is so soft it can be readily shoveled out of place. In some cases even the furrows of the sleepers have disappeared and the mass has fallen together. In the Continental Building the concrete filling is of a better quality, but even there it is seriously disintegrated by the action of the fire and has lost a great measure of its strength. Cinders concrete has been conclusively shown by this fire to be worthless as a fire-resisting material.

The Chesapeake and Potomac Telephone Building.

IMMEDIATELY to the south of the Calvert Building and enclosed by it on two sides is the building of the Chesapeake and Potomac Telephone Company, designed by Joseph Evans Sperry, a six-story structure which has made a most remarkable exhibition of fireproof qualities. The floors are constructed of steel beams with semi-porous terra-cotta arches, and the partitions are built of four-inch porous terra-cotta blocks. The building was surrounded by flames on two sides, and was gutted of everything inflammable, not a vestige of

anything combustible remaining in any story of the building. The structure across the alley towards the south entirely disappeared, and the Calvert Building was a mass of flames throughout its entire height. So far as could be ascertained by inspection none of the fireproofing in the Telephone Building had suffered any damage. The ceilings appeared to be in perfect condition throughout, none of the partitions have fallen, although a few of them have sprung, and altogether it was a most remarkable demonstration of the extent to which a properly constructed building can withstand the action of heat. There was found through the building the usual assortment of partially melted typewriters, steam pipes twisted out of recognition, glass ink wells melted into an indistinguishable mass, marble burned to powder, and concrete filling hardly holding its shape, but the terra-cotta appears to be as good to-day as when it was put in; and as the exterior of the building is injured but slightly, the repairs are simply a question of interior finish and plastering. The partitions were all self-supporting. No evidence was found of any reënforcement by iron, but the blocks were carefully keyed together, the openings for doorways were laid with carefully broken joints overhead, and the blocks were set in an excellent manner so that when the wooden frames and finish were burned away, the overhead work did not settle. The partitions between the offices and the corridors were pierced by no windows, and no cases were found of the blocks being carelessly or badly cut away for the electric work. In fact, the fireproofing in this building was applied in exactly the manner an expert would advise to secure the best results, and it naturally has stood in first-class shape.

INTERIOR VIEWS, CHESAPEAKE AND POTOMAC TELEPHONE BUILDING.

The fire in this building was terrific, as indicated in the illustrations. The terra-cotta fireproofing, however, is practically uninjured.

Clay Products Tested by Fire.

BY THOMAS CUSACK.

PATERSON FIRE RECALLED.

THE costly but instructive fire test at Paterson, N. J., in February, 1902, received less attention from the professional press than it deserved. The daily papers, of course, gave us pages of flamboyant generalizations which went off in smoke, leaving no tangible record and no lasting impression. Even treated as a spectacle they were too pyrotechnic and not sufficiently technical. The people most intimately concerned made their own deductions from what remained after the ruins had cooled enough to permit inspection, and the outcome showed that, on the whole, they made them correctly. Those more remotely situated, however, were left in doubt, many of them in utter ignorance as to the strong and weak points revealed in buildings of comparatively recent construction. The main facts may now be briefly recalled in reviewing what has happened in Baltimore on a still larger scale, where object lessons that have cost millions, covering an area of one hundred and fifty acres, are open to investigation.

CRUCIAL CHARACTER OF THE TEST.

In Paterson three buildings of modern construction, two of them supposed to be fireproof, stood in the very heart of the section that was destroyed. The Savings Institution and the Second National Bank were brick and terra-cotta above the first story. On the Hamilton Club these materials were used exclusively from water table to roof. They were surrounded by old buildings, few of which made any pretense of being even fire-resisting. The flames, fanned by a stiff breeze, spread among them in rapid succession, enveloping the three that were comparatively fireproof. We say comparatively, for the windows were shutterless, the glass was not wired, and the wood frames not protected by anything save paint. The glass melted, where it did not crack and fall down; the inflammable contents of the rooms burned until exhausted, while the conflagration continued to rage on all sides; yet the floors, walls and exterior features withstood the ordeal. The Club building had wood floor and roof beams, which, falling in, left nothing but the four outer walls. Scorched and discolored, it is true, but these buildings were there the day after, grim and defiant, the center of attraction in a scene of widespread devastation. They stand there to-day in eloquent, unanswerable testimony to the efficiency, if not the invulnerability, of burned clay. A few pieces of balustrading, weighing in all about five hundred pounds, had to be replaced during the progress of cleaning and restoration on the bank, while the other two buildings did not require a single block of new work.

TERRA-COTTA AND BRICK IN CONTRAST WITH STONE.

The new City Hall, standing between two of these buildings, but isolated on all sides, suffered very extensively. The granite flew off in splinters, the limestone calcined as easily as marble, flaked and, after absorbing moisture, moldered into dust. These contrasts did not pass unnoticed by the architects and people of Paterson. They took up the work of rebuilding with a spirit and enterprise that may be emulated by the older and more wealthy city of Baltimore, but can hardly be surpassed. Brick and terra-cotta became more popular than before; while stone, with the exception of what was used in re-facing the City Hall, has not been in general demand. Recent information would indicate that stone is not now considered the only badge of respectability in Paterson.

Similar contrasts obtrude themselves on every hand in Baltimore, where they are equally striking and ten times more numerous. There are buildings on which hardly a single stone has escaped injury, while in some places the destruction amounts to almost total annihilation, and so cannot be reproduced by camera. The new Custom House, of which two stories have been built, had no fire of its own to trouble about, but heat radiating from across the streets has defaced it in spots. Granite blocks piled on the sidewalk close to the building line and five or six feet high, cased with corner strips and bound with hoop iron, behaved very discreditably. Some of these one-inch casings burned off, but many or them remained only slightly charred; yet the granite is calcined and splintered in all directions,—a phenomenon for which few people would have been prepared. Any number of such freaks have been noted, but this is hardly the time or place for their recital.

WHAT SAVED THE COURTHOUSE.

The new marble Courthouse was saved chiefly by a change in the direction of the wind, in addition to which it was shielded by the Herald on one side, with the Calvert and Equitable buildings on the other. As it is, a portion of the architrave, cornice and parapet on the St. Paul Street front was calcined by heat from the Law Building on the opposite side. What must have happened had the Courthouse itself caught fire will not tax any one's imagination. Placed on the other side of Fayette Street, where the Equitable and Calvert buildings received the full force of concentrated flame, then at its highest intensity, we think there would not have been much left for salvage. On the other side of St. Paul Street, where stand the brick and terra-cotta walls of the Herald Building, substantially intact, it is obvious that nothing could have saved the $3,000,000 marble building from the fate that befell the Law Building, which was stone and without fireproofing.

FURTHER CONTRASTS CONSIDERED IN DETAIL.

There are stone sill-courses on the Herald Building with a terra-cotta egg and dart bed molding below; one has been taken and the other left. The same thing has happened on the Maryland Life Building, the façade of which is the only part left standing. This one remaining wall is brick and terra-cotta above the first story; the fluted columns, capitals and main cornice are intact throughout. A small portion of fillet has been broken on one column, whether by heat or falling débris is uncertain. Not a particle of the more delicate ornament has perished, even the abacus of the capitals appears uninjured, but the devouring element picked out with wonderful discrimination the stone sill-courses for its prey.

WHERE THE STONE WAS SHIELDED.

Some of the structures that were largely of stone have entirely disappeared, but the Rialto and the Hambleton buildings are types of what remain. When used on the lower stories only, the stone was shielded somewhat, the flame sweeping over the tops of low buildings and striking with

redoubled force against the tall brick and terra-cotta barriers, a fact that gives the contrast additional significance. Modern construction, on the whole, gave a good account of itself. That such buildings did not show a greater immunity from risk or remain unscathed was due to the fact that there were not enough of them to leeward of the spot where the fire originated. An editorial in the New York *Tribune* of the 19th inst. sums up the situation as follows :—

"Fire insurance experts of the highest ability and of long experience do not like to see granite buildings of importance going up in this era. A monumental public structure of great size may be safely built of granite if it stands alone, with wide spaces all about it, say in the center of a park. But the great fires in Chicago, Boston and Baltimore prove beyond question that thick walls of granite crumble and flake, disintegrate and tumble, when beaten upon by tempests of flame."

THE RIALTO BUILDING, SHOWING THE EFFECT OF FIRE ON STONE.

RELATIVE MERITS OF BURNED CLAY.

The material that shows to best advantage in Baltimore, that receives unstinted, unanimous recognition alike from disinterested onlookers and critical investigators — the word of five letters that is on everybody's tongue — is *brick*. Next comes architectural terra-cotta generally; floor arches, partition blocks, column casing, etc., all of burned clay. But for the protection afforded by these materials not one of the great "sky-scrapers" would have survived. In numerous places — far too numerous, indeed — where fireproof casing may never have been put on, where it had not been properly secured, and where it had been forced off by exploding and expanding steam and water piping, enclosed alongside the columns, structural members wilted under their load, assuming forms that showed how nearly they had reached a welding heat. Steel beams left naked would have wilted at points where the white and blue flame impinged, and the whole structure would have first sagged on the side that was hottest, then lurched and finally toppled over to leeward. We say leeward, not at all on the score of wind pressure. In every instance the flame was hottest on the leeward side of the tall buildings. Entering them first by the windows on the windward side, the inflammable contents of every room blazed up simultaneously, the flames being carried through the windows opposite with the reducing force of a blast furnace. Every window became a blowpipe under forced draught, but instead

of cool air they were fed by induced currents of white heat, generated some distance below and rushing upward with a suction and cumulative force that hardly anything save fire clay could withstand. The cast-iron sash weights and radiators in some places showed signs of fusing. Even terra-cotta jambs and lintels could not, in all cases, stand the rapid unequal expansion. They did not fuse, crumble or disintegrate, but the suddenly heated face scaled or parted from the

THE MARYLAND LIFE INSURANCE BUILDING.
This building was not fireproof. Note condition of terra-cotta columns. Demolition had begun before photograph was taken.

backing and fell off. Mullions, behind which were a naked channel, an I or a T section, unprotected except by the wood frames which furnished additional fuel, were pushed out by the buckling ironwork.

INJURY FROM MISPLACED IRONWORK.

The one lesson that this fire forces on the attention of practical terra-cotta men calls for the elimination of ironwork in window lintels. As a rule, lintels having eight or twelve inch reveals can be made perfectly self-supporting. In openings of extreme width, where a channel or I beam may be introduced, it should be placed behind or above the terra-cotta, built over in brick and cased on exposed sides with fireproofing. On no account should it be *slotted into* the lintel, architrave or voussoirs. We have from time to time convinced architects on this point; one of them only a few weeks before the fire, enabling him to obtain a handsome rebate for two sets of beams, extending all the way around an important public building, which were not only superfluous, but would have been positively injurious, had they been used as at first intended. Apart from its behavior in case of fire, ironwork of this kind reduces terra-cotta members to a shell, the soffit flange being rendered weak, and liable to fall off from a chance knock or during settlement of the building. The habit of placing beams within four inches of the wall line should be strenuously opposed. Four inches on paper often becomes one or two inches on the building, owing to irregularities in the ironwork. The steel skeleton may be more or less out of plumb and is invariably at fault in lateral alignment. The mason, whatever his shortcomings, adheres to his line and plumb-rule, even if by so doing the flanges should come clear through the face of terra-cotta. A fitter is sent for and the blocks are slotted out to within an inch of the face, sometimes less, in total disregard of consequences, be they remote or imminent.

When the section of a mullion is not of sufficient area to stand by itself, the iron reënforcement should be cased before the frames are set. The tile need not be more than an inch in thickness, but it should not be omitted, as it was on the Continental Trust Building and with disastrous consequences, for which see view of rear elevation. A safe rule for the terra-cotta man to observe in all such work is that where iron, of the kind just referred to, is not really necessary it is an unjustifiable expense and an unmitigated nuisance.

FAKES THAT HAVE BEEN FOUND OUT.

Stretcher bond, with clip headers and metal ties, against all of which so much has been said and so little done, has surely sounded its own death knell in Baltimore. The four-inch veneer has fallen off, not merely by the square yard, but by the square. This is one of the worst of several discreditable survivals in the building practice of to-day. In Europe it is known only as a criminal offense of American invention — one that has not as yet gained a foothold elsewhere, unless it has been transplanted in the much-talked-of Westinghouse brickwork at Manchester, England. Why the accursed thing should be winked at by reputable architects, why it should not be penalized and prohibited, is beyond comprehension. In the same category may be placed all kinds of partition blocks into which lime, plaster or partly burned coal in the form of cinders enters as an ingredient.

POROUS AND SEMI-POROUS FIREPROOFING.

The conclusions reached in relation to fireproofing, by architects, engineers and insurance experts, are decidedly in favor of porous or semi-porous terra-cotta. The hard dense bodies did not have sufficient resilience to take up the inevitable expansion. As a result of this, the soffits cracked soon after the plaster had fallen off, allowing flame to enter the open chambers. An independent examination extending over two days enables the writer to vote with the majority in favor of porous terra-cotta, without doubt or reservation. Some architects, following the same line of argument, endeavor to reach similar conclusions in regard to exterior ornamental terra-cotta. At that point we part company.

ARCHITECTURAL TERRA-COTTA MUST NOT BE POROUS.

We have listened to the demands of architects on this and the other hemisphere during the past thirty years for hard homogeneous goods with an absolutely impervious face, and for a good portion of that time have helped to supply the want. Having reached the long-sought goal, at which we can pause and challenge the red ink test, shall we from this date retrace our steps and consider "love's labor lost"? Are we to turn back the clock a score of years to the discarded specimens that disgraced the industry up to, say, 1893, when the porous surface had to be painted to prevent disintegration during recurring winters? Suggestions such as this, even from an architect, remind us that "too far east is west." Fireproofing that is not exposed to rain or frost may be as porous as you please, but architectural terra-cotta belongs to a different family. It must be hard, non-absorbent, smoke-proof and self-respecting under the most variable climatic conditions. Every company in the business has been gradually approaching such a standard, having most of them reached it some time ago. They will continue to perfect their output along the same lines in the light of recent experiences; to which end, experiments are already in progress.

A BOON TO BALTIMORE AND ELSEWHERE.

The disaster will, in time, be accepted as a blessing to Baltimore, for in a new and even better sense she will rise and renew her title as the Monumental City. Cities, no less than men, "may rise on stepping-stones of their dead selves to higher things." So far she has furnished an exhibit of unexampled magnitude, costly to those at whose immediate expense it has been made, but free to all who are themselves free to profit from it. It is certainly proving a liberal education to all kinds and conditions of men connected with building, who at this writing have added considerably to her floating population. Some are there for data, some for ducats, but whatever their mission they are getting experience at first hand from which to revise and readjust their theories. Let that be done frankly, without regret and without delay, seriously as a task and hopefully as an inspiration.

BALTIMORE AND OHIO BUILDING.
Showing utter ruin of stone trim around openings.

Building Materials which did not Stand the Fire.

IT has been said that a fire such as this could be made to prove almost anything, and if one were to simply look for confirmation of preconceived ideas it would be very easy to find such ideas verified by the results. The terra-cotta undoubtedly had to withstand the fiercest attacks of the flames. In nearly every building it was noticeable that the fire was much more destructive at the top than at the bottom, and it was fortunate for all the steel frame structures not only that so little stone was used, but also that when used it was chiefly in the lower portion.

GRANITE ON GROUND AT CUSTOM HOUSE, BADLY SPALLED, THOUGH HEAT NOT INTENSE.

The Merchants' National Bank is an eight-story steel frame building on Water Street, extending from South to Holliday Street. The exterior is faced entirely with a pink granite. The fire came from the South Street front, swept through the building, practically wrecking everything except the construction, and went out through the Holliday Street windows. On the South and Water Street fronts the granite is very little injured, but on the Holliday Street front it is so shattered by the heat that very little of it remains, and what is there is barely hanging in place. The fire attacked but slightly the other two fronts, as is shown by partially consumed woodwork around the windows and by some of the glass not being broken. It is evident from the condition of the Holliday Street front that had all the fronts received an equal assault from the flames none of the granite would be intact to-day.

The United States Custom House is in process of construction on the square bounded by Water, Gay and Lombard streets and an alley. The exterior is entirely of a cold, close-grained granite, and the structure is carried up to about the middle of the second story. Along the Gay Street front a spur track has been put in place upon which at the time of the fire were some freight cars loaded with stone partially crated. There was also quite a quantity of granite piled in front of the building close to the wall and bound with wood to protect the edges. The fire here was manifestly not very destructive, and yet wherever it touched the granite the stone was ruined, and the total damage to the building will be very large.

In the Maryland Trust Building the stonework of the lower story is very badly broken, notwithstanding that all of the woodwork of the sashes about the entrance and in fact the whole of the entrance hall is almost uninjured. In the upper stories one and one-half inch slate sills were placed over the terra-cotta as a protection against the weather. This slatework is in nearly every case shattered by the heat so as to be useless.

In the Equitable Building the stonework was very little exposed and suffered very little in the lower stories, but where the flames actually struck the building, especially on the side towards the Calvert Building, the granite sills and the terra-cotta finish were subjected to an equal degree of heat. Here the terra-cotta is practically uninjured, while the granite in nearly every case is ruined.

In the Herald Building almost the only structural damage is to the stonework in the lower stories. On the Fayette Street side the finish about one of the windows is cut off clean, flush with the face of the wall, as if done with a tool. The balcony on the Fayette Street side, which is of stone, is badly broken in several places, and in the upper stories where stone sills and the terra-cotta received an equal exposure the terra-cotta suffered not at all and several of the sills were ruined.

DETAIL, CALVERT BUILDING, SHOWING BADLY SPALLED STONE.

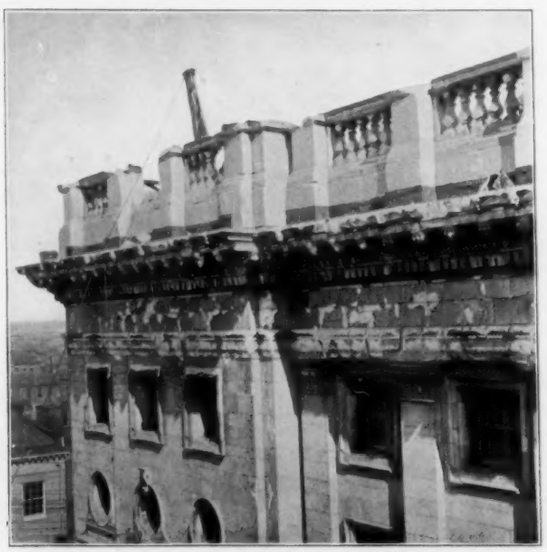
In the Calvert Building the two lower stories are of stone. On the west front, while the terra-cotta of the upper portion, which received the most heat, is hardly injured at all, nearly every individual stone in the lower two stories is cracked or broken so it will have to be removed. In the hall in first story there were a number of columns of solid white marble. These have gone to pieces like plaster and some of them are hanging in shreds ready to topple over at the least touch.

The new Courthouse is built of white marble. The front on Fayette Street was partially protected by the Herald Building, but the adjoining Law Building on Lexington Street was

a total wreck, and the flames here had a chance to attack the Courthouse with a result that the surface of the ashlar, the cornice and the balustrade above are all badly damaged. This work is now being replaced by the city. This Courthouse, by the way, affords an illustration of the fact that the effect of the fire blast was upward. The greatest damage was to the cornice.

The Union Trust Building was of limestone in the three lower stories. There were perhaps a dozen stones which the fire left intact. All the rest were broken beyond repair.

Adjoining the Equitable Building on Calvert Street is a structure occupied by the Baltimore and Ohio Railroad. This



CORNICE OF THE NEW COURTHOUSE, SHOWING DAMAGE TO THE MARBLE.

is an old-fashioned design of brick and sandstone with a Mansard slated roof. There is considerable stone finish about all the windows and the whole building is an utter wreck. There is not a single piece of stone that isn't hopelessly ruined and the slates are all gone to fragments.

The lower portion of the Continental Trust Building is of stone. It escaped any serious damage simply because the exposure was but slight. Directly opposite the Continental Trust was a bank building with a most elaborate carved front of limestone or sandstone. It looks like a frost-bitten apple now, and the details are hardly traceable through the wreck. The same is true of the stonework of the Commercial and Farmers' Bank Building, the First National Bank, the National Bank of Commerce, and in fact in every structure throughout the burnt district the fire had but to touch the stone and it split to pieces or crumbled away. Marble was even less reliable than granite.

The International Trust Building is a one-story bank, fireproof in construction. The roof was broken in by the fall of the adjoining building, and the fire burned out most of the interior fittings. The front is quite elaborate and of white marble, which is white no more, but has been turned a beautiful light yellow by the effect of the heat and in a number of places had been badly spalled and checked by the fire. Pieces of white marble picked up in the street close by the International Trust Building, but not necessarily from this one, would crumble between the fingers like soft lump salt.

The building of Alexander Brown & Co., a one-story structure opposite the end of the Continental Building, was only slightly damaged by the heat on the interior, and the exterior is practically intact. It is a marble and brick building. Toward the rush of the fire there was presented a solid brick party wall, but where the flames licked around the corner of this wall on Baltimore Street the marble is eaten out and spalled in a number of places. Had this been terra-cotta it is doubtful if the entire structural damage would have been more than a very few hundred dollars.

One of the most picturesque examples of the action of the fire on stone is afforded by the United States Appraisers Stores at the corner of Lombard and Gay streets. This is a very simple four-story structure with small windows glazed with common glass, most of which is still in place, the wood sash even not being consumed. For the interior there is an elevator well running through all stories, capped by a skylight. The floors are constructed with groined brick vaultings in bays about twelve feet square in plan, springing from piers of granite about two feet square. The fire entered through the elevator skylight, worked down into the third

DETAIL, THE HERALD BUILDING, SHOWING BADLY SPALLED STONE.

story and consumed the contents, but not sufficiently to wreck the building. Some of the granite piers, however, which were surrounded by fire are badly damaged. One went to pieces entirely, leaving the brick vaulting hanging in place, and several of the others are so badly spalled away that the remaining stonework is barely six inches square.

Marble tiling suffered in every building where it was exposed to fire. In many cases the marble was reduced to fine powder. In others the marble would seem to swell under the action of heat and buckle out of shape, not coming

back to its original size upon cooling. Often the marble would thus swell and cool without cracking. This was particularly noticeable in one of the lavatories of the Continental Building, where the marble slabs on the ceiling expanded under the heat and hung down in great scallops without breaking. This shows that under sufficient heat marble becomes quite flexible, and also that it does not regain its shape upon cooling.

HAMBLETON & COMPANY'S BANK BUILDING, SHOWING THE EFFECT OF FIRE ON LIMESTONE.

The failure of the marble columns in the Calvert Building hall has already been referred to. The principal room on the first floor of this building is occupied by a bank. The bank screen, which was of marble, has been so used up by the fire that it is hard to find even fragments. The fire in this room must have been very hot, as is evidenced by electric light bulbs melted down in fantastic shapes, and the plate glass windows which were blown in by the force of the fire and melted in place on the floor. The floor tiles of marble are badly buckled out of shape, and many of them are reduced to powder.

In most of the fireproof buildings the floor boards were nailed to sleepers imbedded in cinders concrete. In no case did this stand well. The best example was in the Continental Building, and even there the concrete filling was so broken up by the heat that a slight push with the foot would cause it to crumble.

The list might be extended indefinitely. If there is any one unmistakable lesson of the Baltimore fire it is that stone of any kind is absolutely unreliable even under the conditions of an ordinary fire, and that in a conflagration of this sort it is sure to suffer total wreck.

Fireproof Partitions.

THE behavior of the partition work in the six prominent fireproof buildings in Baltimore has not been in every instance a conspicuous success, although this was due to no fault in the material itself. Many of the partitions are down as a result of the fire, though the unbroken individual blocks are in as good average condition as those which would be delivered to a new building. The failure is due almost wholly to the manner in which the material was used. In most of the buildings the openings in the partitions were framed with wooden studs, which burned away, allowing the blocks to sag out of shape. In none of the buildings was the plastering of sufficient strength to afford any reënforcement after the fire had struck it and after the wooden doorposts had burned away. Even where partitions were unbroken between rooms, in some cases they are found to have been put up without the use of cement mortar and were not braced except by their own keying. Where the partitions had been shifted after the building was completed it is sometimes found that the blocks had been laid, not upon the fireproofing, but upon the upper flooring, which would burn away, allowing the partition to sag, with the result that a slight blow would demolish the whole. Another defect was that most of the partition work was started, not upon the arching, but upon the cinders concrete filling, which was so ruined by the fire that it became a wholly unsuitable foundation to support even so light a structure as a four-inch partition. Partitions so constructed in these buildings offered but slight resistance to the spread of fire. It must be remembered that the greatest damage in all of these structures was caused, not alone by the fire coming from without, but by the added degree of heat contributed by the combustion of the wood flooring, the finish and the contents of the building. There is no reason why a terra-cotta partition should not be so built that it will withstand practically any degree of heat from a fire without yielding. But we cannot expect a construction to be fireproof when it is founded upon either wood or cinders concrete, or when it is cut full of holes after being set. Furthermore, a common practice, which is observed at Baltimore quite as much as anywhere else, is to score out the face of the terra-cotta partition work for the electric ducts and outlet boxes. A partition constructed in the manner described is weak enough to start with, without deliberately sacrificing a portion of strength in this way, and no amount of patching with metal lathing and plastering would ever make up for the destruction of the terra-cotta itself.

It would seem as if the best form of construction used for partitions were one which was braced between each course with metal studs, continuous from the top of the arch to the soffit and buried in the thickness of the terra-cotta block. Then all the openings ought to be framed with iron continuous from floor to ceiling, and if to this were added the security of metal doors and trim, and no openings were allowed except the doors between the corridor and an office, it would be almost impossible for any fire to spread through such construction. The manner in which the partition work stood in the Telephone Building is ample proof that terra-cotta is a wellnigh perfect material for partitions when used properly, while the experience of all the other buildings is that no other material has stood at all.

A good fireproof partition should have no combustible

material incorporated into its construction. Openings should be framed with iron. The material should be thick enough to make the wall strong laterally. In the writer's opinion it would be better made of porous or semi-porous material than of hard-burned. The Baltimore fire emphasized the importance of the first observation. In all these buildings the doors and windows in the partitions were framed of wood. This wood was almost everywhere completely consumed, and, in consequence, the partitions as a whole were almost a complete wreck. The falling away of half-burned timbers in the partition carried with it the blocks of terra-cotta that adjoined it, and wherever the blocks were built over wooden material that burned away they fell down. Between these two effects the partitions were ruined.

THE COMMERCIAL AND FARMERS' NATIONAL BANK BUILDING.
Wyatt & Nölting, Architects.
Showing damage to stone where licked by flame.

WIRE glass is now manufactured in polished sheets, and one arrangement which has been proposed for the rebuilding of one of the large buildings in Baltimore contemplates the use of three sashes, one glazed with clear glass to be down during the day and serve for the lower sash. The upper sash is glazed with polished wire glass, and has beside it a third sash with wire glass which slides down at night so as to completely cover the opening.

Ideas Gathered at the Fire.

BY D. EVERETT WAID.

FIRST. — It is safe to say that the Baltimore fire did not discover to thoughtful students of fireproofing methods any startling new facts; but it emphasized in a startling way the importance of not neglecting already known safeguards. The most serious charge against burned clay protection for structural steel does not relate to its fire-resisting qualities, but rather to defective design and construction. Sufficient study is not ordinarily given to the anchorage of fireproofing. Where fire is hottest and lack of protection is most serious — as in the case of lintels, roof trusses, and soffits of beams — metal clips or anchors whose free ends soften and give way in flame should not be trusted. Wire is cheap: let every unit of fire clay covering be secured with wire twisted into a continuous band which will not part even if heated to incandescence. Let column coverings be bonded with broken joints and be wired in addition, to withstand the shock of a stream of water.

Speaking of column coverings recalls another Baltimore lesson. There were instances in the best of the Baltimore office buildings in which column fireproofing formed flues about the naked steel. Let there be an air-tight cut-off at each floor at least, if you will not fill all the space around the column with concrete to serve at once the double purpose of backing up the tile and preventing corrosion.

Second. — Stairs. One of the latest of Baltimore's sky-scrapers had just one little narrow staircase and that open to the adjoining elevator shafts, whose blast of flame would have sacrificed hundreds of lives if the fire had occurred on any day but Sunday. A building with two thousand people in it surely should have *one* enclosed staircase as far removed from other shafts as possible.

After the fire in Baltimore one could look down through marble stair landings as through a shaft. That city should, as does New York, require iron treads under the marble.

Third. — Fire Screens. Non-combustible contents are not among things to be hoped for. Hence the principle of divisions for fire stops should be kept constantly in view. Partitions should be anchored more securely at the top to withstand the physical impact of fire and water, and windows in corridor partitions should be omitted if possible or made fire-resistant.

Fourth. — Floor Surfaces. A newspaper in a stove will make a roaring furnace and throw out a surprising amount of heat for a few seconds. So 100,000 feet of lumber required for the mere surfacing of floors in a small office building is enough fuel to roast or smother all the people in the structure. Let floors be surfaced more generally with incombustible material.

Fifth. — Windows. Why not aim to make all windows in all commercial buildings effective fire stops? If they have not to keep fire in, they should be ready to keep it out. So long as transparent wire glass is prohibitively expensive, small lights of ordinary glass in metallic sashes are a great advance over unprotected large sheets of plate glass. Why not for an office building use common wire glass in small panes for the upper half of windows, and the usual plate for the lower half? Outside iron shutters deteriorate rapidly, even when not out of the question for other reasons. Inside iron shutters may be used in some form, folding, rolling, sliding or hinged. If you can have none of these, why not con-

sider wire mesh screens, either iron inside to roll like a spring shade, or copper outside to protect from flames on the principle of the miner's safety lamp? On court walls a single screen could drop from the top of a building like a rope ladder or a rolling fire escape, and cover a row of windows.

For the fronts of office and other commercial buildings, however, may we not hope to see more serious efforts to design windows desirable from all three points of view, — that of the fire fighter, of the inside observer, and of him who sees the exterior of the building? In such an effort small panes set in metal might be grouped agreeably about larger panes located where the view should be least obstructed.

Sixth. — We wait for great disasters to impress upon us the importance of guarding against dangers which we already know. If a theater fire and a fearful sacrifice of life are necessary to bring about the enforcement of existing laws meant to protect against well-recognized dangers, must we conclude that other disasters are to come before even laws can be formulated against other dangers just as real as fire? Corrosion of structural steel is a danger ever present to engineers, and one which is guarded against in railroad bridges, but not as it should be in buildings.

COLLEGE OF PHYSICIANS AND SURGEONS.
Joseph Evans Sperry, Architect.

Speculative-built hotels and apartment buildings are going up in New York City alone to the extent of many millions of dollars in cost every year. Paint is often paint only in name, and structural members are rusting before they are built in. When they are enclosed, the envelope in many places is but a thin veneer of porous brick with almost open joints. There is nothing to prevent corrosion going on indefinitely, and it can proceed with surprising rapidity under favoring conditions. The writer recently inspected for a prospective purchaser an office building in Chicago which he had observed carefully during its erection ten years previously. In one instance he lifted off two thick rust scales one above the other and each one and one-half inches by twelve inches. The thick lower flange of a twelve-inch beam was nearly half gone.

One need not claim to be a prophet to predict that before many years have passed, if no accidents have happened, it

BALTIMORE ATHLETIC CLUB.
Parker & Thomas, Architects.

will be because expensive renewals and repairs have been made in anticipation of disaster from corroded structural parts.

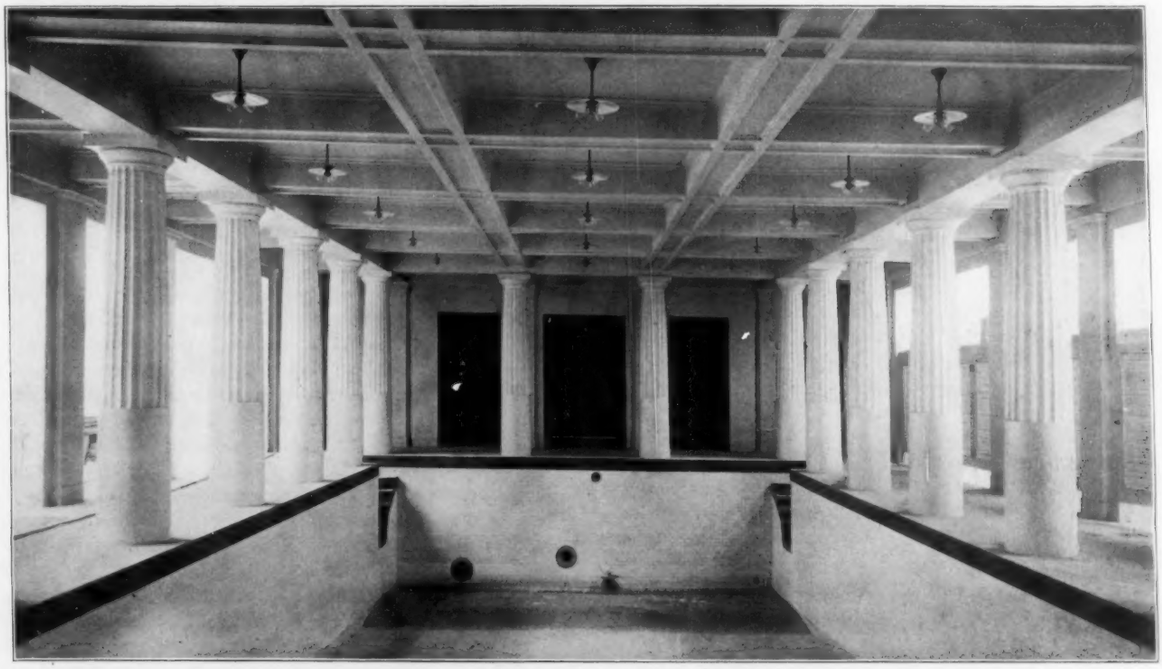
FOR the first fortnight after the fire the authorities refused to issue any permits to rebuild, but subsequently, acting upon legal advice, the city issued permits for reconstruction, but all were coupled with the stipulation that in accepting them the owner bound himself to hold the city harmless from any damages caused by change in grades or street lines, and the effect of such restrictions was to practically stop all attempts at rebuilding. Plans, however, are under way for the reconstruction of nearly all the prominent buildings, and several new structures are comtemplated. There seems to be a disposition, however, to go very slowly in the matter of rebuilding, and it would not be surprising if many years would elapse before the burnt district assumes anything like a finished appearance; and it is quite probable also that the effect of the fire will be to move the center of business farther towards the northwest, leaving more space for the shipping and commercial districts.

Interviews.

THE fire was of such an extraordinary nature that it drew to Baltimore experts from all parts of the country. The insurance interests were especially well represented by men who gave most serious thought to the problems involved, and acting individually and on the various committees of investigation and adjustment they were able to form very definite conclusions as to actual results. Many of the insurance men were interviewed by THE BRICKBUILDER, and from a number were selected two as in a way representing in their utterances the point of view which was found to be held by nearly all their colleagues. The insurance companies, as is usually the case in adjusting the loss in a conflagration, pooled their issues to a very considerable extent and minimized the labor of adjustment by dividing the work among committees. Major Charles F. Hard, of the Continental Insurance Company of New York, is the chairman of the joint committee having general supervision of the settlement of the fire losses. He was seen some two weeks after the fire and expressed himself as follows:

MAJOR CHARLES F. HARD.

"I think that after this and as a result of the lessons of the Baltimore fire the insurance companies will be ready to penalize in their rates everything except terra-cotta and brick. Stone is absolutely no protection, and the evidence shows that in all the buildings terra-cotta was subjected to a very severe test. I do not see how any building could have had a worse test than that to which the west front of the Continental Building was subjected, and yet the terra-cotta on this structure has stood very well and is all that could have been expected of it. There are very few places where the terra-cotta dropped off, and if the building had been faced with stone there would probably have been nothing left of it at all. The value of the Continental Building is in round numbers $1,000,000. The total damage claimed by the owners is $720,000. It is too early as yet to say what the actual appraisal damage will be, but it will probably not exceed $450,000, including the damage to all of the machinery, the interior finish, steam work, wiring, etc. The constructive terra-cotta appears to have perfectly protected the frame and is but very little damaged. The plastering on the ceilings is most of it in place, but can be easily removed by sand blast, leaving the soffits all ready to plaster. In like manner, also, the exterior terra-cotta can be speedily and satisfactorily cleaned by the sand blast. In the light of experience here, as well as elsewhere, I should employ terra-cotta by all means for the exterior of a building rather than any other material."



SWIMMING POOL, BALTIMORE ATHLETIC CLUB.

In adjusting the losses the insurance companies called to their assistance a number of expert appraisers, of whom one of the best known is Mr. Samuel R. White, a builder of Bloomington, Ill., who for a number of years has been associated with the various insurance companies as a general appraiser, having examined and adjusted losses in nearly all parts of the country. He was an appraiser of the losses in connection with the Horne Building at Pittsburg some years since, also the Iroquois Theater at Chicago, and has been retained as appraiser for the insurance companies on the Continental and the Union Trust Buildings in Baltimore.

SAMUEL R. WHITE.

He stated that the first newspaper stories were so inaccurate regarding the damage to fireproof buildings that he did not expect to find anything to appraise when he reached Baltimore, but these reports were altogether wrong. He has always contended that the insurance companies should give

better rates on a well-constructed building independently of the material, and the same rate ought not to be given to a granite or stone building as to one of terra-cotta. This fire means a tremendous readjustment of insurance rates both as to exposure and as to construction, and stone will undoubtedly be more heavily penalized in the future. Terra-cotta is used more and more every year, and its use will grow as a result of calamities of this sort. We have passed the experimental state and know perfectly well of what the material is capable. The plain terra-cotta of course stands the best, and in proportion as the projections are increased the risk of partial or complete damage is greater. He was not prepared to state the extent to which the buildings are damaged, as the official investigations are still under way, but even the most casual inspection shows that terra-cotta has stood the best of any materials employed. The fire, furthermore, is a splendid test of the resisting qualities of wire glass. When properly employed this material has been most useful in checking the spread of fire, and it would seem to be highly desirable to employ it for all windows in buildings which are to be of fireproof construction.

He further called attention to the manner in which shutters had proven of little value in this fire. The ones which have resisted the best are the standard tin-covered wood shutters, but in a heat so intense as prevailed in this conflagration the wood was simply charred and went to pieces behind the tin, which of course then had no sustaining qualities. The shutters in the Herald Building appear to have all been closed before the fire and were of this description, but every one of them was destroyed, leaving nothing to protect the openings. Had the windows been further protected with wire glass, the glass might have melted, but it would have served as a check to the spread of fire. In Mr. White's judgment the plastering upon the inside of the buildings, instead of being of ordinary lime mortar, would have stood far better if it had been of cement applied directly to the terra-cotta blocks, and all of the partition work should have been set in Portland cement mortar. The spread of fire through the fireproof buildings was due in large measure to the repeated yielding of the block construction, rather than to any insufficiency in the terra cotta itself.

FRANCIS H. KIMBALL.

Mr. Francis H. Kimball, of New York, is an architect who is known throughout the country for the high character of his work and for the care with which he studies the architectural and constructive detail. He made a close examination of the structures which survived the fire at Baltimore, and stated to THE BRICKBUILDER that he had made up his mind to pin his faith hereafter to flat arch terra-cotta construction floors. He could not see that there was any fault to find with the action of architectural or structural terra-cotta in the Baltimore fire. Both had stood all that he had expected, and the few failures were due to methods of use rather than to the materials. He should advise eight-inch terra-cotta protection for the structural columns instead of four-inch, and would have all the column casings not only keyed together and set in Portland cement, but also strapped with metal ties. The use of stone for the lower stories on the exterior will undoubtedly not be greatly modified as a result of the Baltimore fire, but it will hereafter have to be used with full knowledge that it would yield in a fire and that nothing but terra-cotta could be depended upon to resist the flames.

D. H. BURNHAM.

Mr. D. H. Burnham, the eminent Chicago architect, wrote the following letter in reply to an inquiry from Mr. S. Davies, the president of the Continental Trust Company of Baltimore, whose building Mr. Burnham designed:

Dear Sir, — I have minutely examined the steel structure of your building on the corner of Baltimore and Calvert streets from the basement to the roof, and find the same intact and good as the day it was put up. This applies to the supporting columns, the girders and joists. A few of the apron beams between the supports of the windows of one story and the sills of windows above in the court must come out as they are warped. These, however, have nothing to do with the main structure, as they only carry said aprons, and they can be taken out story by story without reference to any other part. The structural part of the floors of the building are unaffected and need no removal. I advise you to at once proceed to repair this building.

Very truly yours,

D. H. BURNHAM.

Mr. William Barclay Parsons, so well known for his work in Boston and New York in connection with the Rapid Transit Commissions and one of the foremost engineers in the country, went to Baltimore especially to study the fire and is quoted as follows in the New York *Tribune* of February 16:

WILLIAM BARCLAY PARSONS.

"I found that all the modern, really fireproof buildings had come out of the conflagration practically unscathed and intact, the first reports to the contrary notwithstanding.

"By really fireproof buildings I mean those where the steel frames are protected by non-combustible material, such as brick and terra-cotta, with a thin curtain wall on the outside attached to the steel frame and with floors and partitions of brick or terra-cotta. There were a number of such buildings, from twelve to sixteen stories in height, within the fire zone, and I visited a number of them. I found them structurally substantially uninjured. The steel frames were not distorted, and the fireproof partitions and floors were all in place, except occasionally, when a heavy safe had broken through the flooring and fallen two or three stories.

"In these fireproof buildings everything combustible had been absolutely destroyed; every vestige of furniture, doors, trim and floor was gone. To give you an idea of the intensity of the fire which raged within these buildings let me tell you that even the sleepers, which are the long pieces of wood encased in the concrete floor and to which the transverse flooring is nailed, had been consumed, and this notwithstanding the fact that they were protected on three sides from contact with the flames by non-combustible concrete and were detached from one another. As for the walls, I found that those in which the chief component part was brick stood the ordeal best. As in other fires, the walls made of granite fared worse. Under the influence of the extreme heat the granite scaled badly and practically all the walls in which granite was used will have to be replaced.

"Terra-cotta, as a general thing, stood well, the damage to the exteriors composed of that material being chiefly due to falling débris of near-by buildings."

HARRY D. GUE.

Mr. Harry D. Gue is one of the many prominent fire-insurance engineers who have studied most carefully on the spot

all of the conditions following the fire. He is quoted as follows in an interview published in the Baltimore *Herald*:

"The most obvious lesson to be drawn from the conflagration in Baltimore concerns itself with the fatal weakness presented by window openings in the outside walls of buildings unprotected against the attack of fire from without.

"Buildings having brick or stone walls, when erected in accordance with the laws of any city in America, are of sufficient strength to withstand the attack of ordinary neighboring fires, provided the outside window and door openings are made as fire resistant as the walls they pierce.

"Such protection is thoroughly practical and may be accomplished by either of two means: by iron shutters or by wire glass windows in metal frames. Both types of protection are approved by fire underwriters, although wire glass windows are preferred by many on account of their obvious advantages. They do not require to be closed in a moment of emergency, being an integral part of the building they are not subject to corrosion, they are eminently sightly, and when made of polished plate are suitable for use in building fronts where iron shutters are quite inadmissible; and, above all, they offer a degree of fire resistance equal to the wall in which they are set.

"Had the buildings contiguous to the structure in which the Baltimore fire originated been provided with efficient window protection there is every reason to believe that they would have withstood the contribution of flame until such time as the fire department could have controlled the original blaze. Taking fire almost immediately, however, the firemen's attention was diverted largely, and soon a conflagration which no human power could stay was in progress."

PEREZ M. STEWART.

A large company of builders and contractors came to Baltimore shortly after the fire and made a quite lengthy stop, investigating conditions very thoroughly. One of the number was Mr. Perez M. Stewart, formerly building inspector of New York, a builder who has had a wide experience with large work. In a letter to the New York *Times* he is quoted as follows:

"The most important lesson to be drawn from the Baltimore fire is that of the exposure hazard. Rising sheer from the widespread area of devastation are a number of buildings of the so-called fireproof type. As regards a fire originating within their own walls, they are fire resistant in high degree, but by reason of their size they present a great area of wall space to the attack of flame from without. It is the unanimous opinion of the fire engineers whom we have met that had the Calvert, the Equitable, the Continental Trust and the few other steel frame buildings in the city been provided with efficient window protection, such as wire glass in metal or metal-protected frames, with some type of fire-resisting shutters, they would have suffered no more serious damage than the chipping of corners from the stone facing of their lower floors, and some of them would have escaped that. In every instance where modern practice in covering the steel frame and in constructing floor arches and partitions had been honestly followed, the damage suffered has been relatively small. Every form of construction recognized as weak by experts failed in Baltimore, while the several systems which past experience in experimental test or practical application have won confidence again demonstrated their efficiency."

Editorial Comment.

WITHOUT exception, the architectural, engineering and constructional publications throughout the country have given a great deal of space to consideration of the Baltimore fire. From the many editorial utterances we have space to quote but a few as in a way expressing the sentiment which finds an echo in nearly all of the technical journals.

The *Engineering News* of New York, in its issue of February 18, comments as follows:

ENGINEERING NEWS.

"The story has gone abroad that fireproof building construction is a failure when tried by fire. To one who watched these buildings endure the flames at Baltimore, or who sees them now looming up, with unbroken walls from pavement to cornice, a solitary figure in a scene of chaotic destruction and desolation, they must excite admiration and pride in the structural soundness that enabled them to stand where all else was leveled to the ground. In all of these the steel framework is intact and plumb, and with a new member in one or two places will be as good as new; in all of them the exterior walls are structurally sound, although exhibiting surface blemishes due to spalling in all but one, ninety per cent of the floor arches are intact, and of the remaining arches not more than a quarter will have to be wholly rebuilt; in all, every window is gone, and every item of finish and contents has been destroyed; in all, ignition resulted from the flames of adjacent non-fireproof buildings breaking through the unprotected windows. This is the record of the fireproof buildings in the Baltimore fire."

The *Iron Age* of February 25 contained a very complete account of the action of the fire with a full description of the various materials exposed therein. From its long and very able editorial statements we quote as follows:

IRON AGE.

"The modern steel frame building has under this latest fierce test vindicated its existence. If properly protected from the direct contact of the flames, steel will withstand the effects of fire. If the lessons taught by the Baltimore catastrophe be followed, we possess in the modern protected steel frame a structure which can be absolutely relied upon to withstand the most serious conflagration.

"After the smoke of the Baltimore conflagration had commenced to lift, when the ruins began to cool and after the daily prints had proclaimed that 'the steel frame fireproof buildings in Baltimore burned up as if they were made of *papier-maché*,' engineers and architects of world-wide reputation assembled to climb over the *débris* and ascertain why their efforts of years should have been 'destroyed like grass in a prairie fire.' And they found, instead of the picture first held before them, just the reverse conditions. For towering above low mounds of brick and stone and an occasional fragment of upright wall, they saw the giant structures standing erect as monuments to the efficiency of the fireproofed steel cage type of construction. Those structures had stood a test for which no building was ever designed, and with devastation all about them they pointed not only to their own superiority, but told the story of the awful test which they had survived structurally intact.

"The best evidence possible of the fireproof qualities of these edifices is found in the fact that they still stand, while all around was destroyed. That was as much as could possi-

bly have been expected, for they were fireproofed only so far as the steel structure itself is concerned, and this was saved."

The daily press in writing of the Baltimore fire has seldom gone beyond reportorial feats. The problems involved are admittedly too technical to be tackled successfully by the average reporter, and most of the newspaper accounts have been purely descriptive or have limited themselves to liberal quoting from the opinions of experts. The New York *Sun*, however, has a most excellent editorial upon the subject in its issue of February 14, in the course of which it states as follows:

NEW YORK SUN.

"In the Baltimore fire modern fireproof construction was for the first time subjected to a supreme and convincing test. The result was a complete demonstration of the effectiveness of this form of construction. Indeed, the fire-resisting qualities which it developed surpassed the expectation of experts. It had been generally conceded that an excessive heat like that generated in the storm fanned Baltimore fire might destroy the life of the steel in a steel frame building, even if the protecting walls of brick should withstand the disintegrating effect of the flames. But the framework of the steel buildings in Baltimore remained uninjured, though attacked by the heat both from within and without."

The Brooklyn *Eagle* published an editorial which is almost an expert opinion popularly expressed, as follows:

BROOKLYN EAGLE.

"If the big Baltimore fire did nothing else it did prove to the satisfaction of insurance men, architects, engineers and building contractors that there was something in fireproofing, after all. The lesson is so plain that perchance the general public, which has made a mock of the terms 'fireproof' and 'fireproofing,' may take it in. The half dozen big, modern fireproof buildings of which Baltimore boasted stood the test — and it must be admitted that it was as severe a one as buildings are ever likely to be subject to — splendidly. They came through it practically unscathed as to structure, though everything about them that was combustible burned so completely that not even the ashes remained.

THE BURNT CLAY LINE OF DEFENSE AGAINST THE CONFLAGRATION.

"At first, in the excitement of the great calamity, it was said that they had been destroyed. And the public, once more communing with itself and with its neighbor, remarked, 'Fireproof, humph! Nothing is fireproof!' But the public, as frequently happens, was mistaken and misled by the mistakes of others. But before the ruins had well cooled, government experts, leading engineers, architects, builders, insurance company experts were down there studying the lessons of the fire. Their reports demonstrate beyond question that sky-scrapers protected by real, non-combustible fireproofing remained intact, and that they are the only buildings that did survive the ordeal."